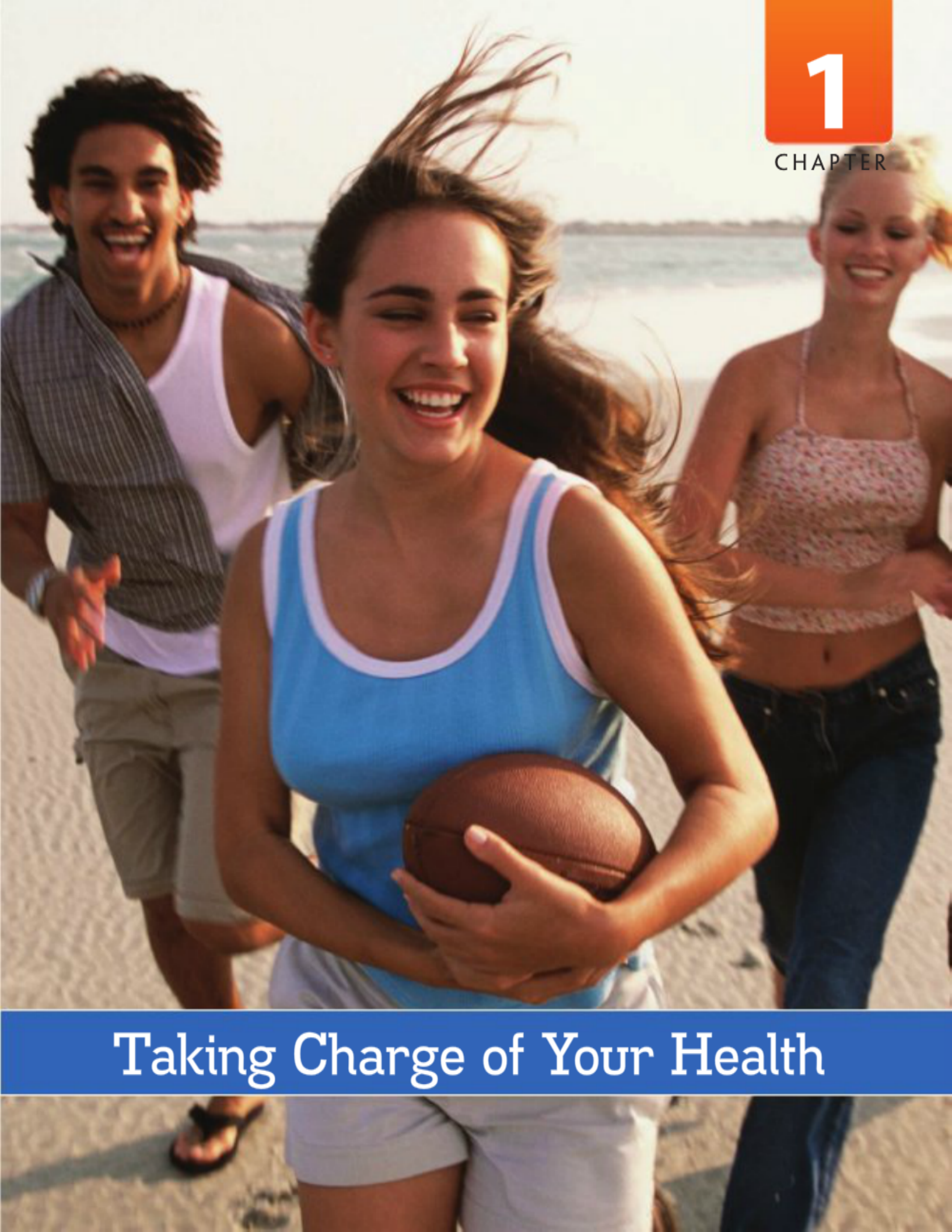


A photograph of three young adults running on a sandy beach. In the foreground, a young woman with long brown hair, wearing a light blue tank top and white shorts, is smiling broadly while holding a brown basketball with both hands. Behind her to the left, a young man with dark curly hair, wearing a white tank top and khaki shorts, is also smiling and running. To the right, another young woman with blonde hair, wearing a patterned crop top and dark jeans, is running and smiling. The background shows the ocean and a clear sky, suggesting a sunny day.

Taking Charge of Your Health

LOOKING AHEAD...

After reading this chapter, you should be able to

- Describe the dimensions of wellness
- Identify major health problems in the United States today
- Describe the influence of gender, ethnicity, income, disability, family history, and environment on health
- Explain the importance of personal decision making and behavior change in achieving wellness
- List some available sources of health information and explain how to think critically about them
- Describe the steps in creating a behavior management plan to change a health-related behavior

TEST YOUR KNOWLEDGE

1. Which of the following lifestyle factors is the leading preventable cause of death for Americans?
 - a. excess alcohol consumption
 - b. cigarette smoking
 - c. obesity
2. The terms *health* and *wellness* mean the same thing. True or false?
3. Which ethnic group has the highest annual death rate?
 - a. Blacks
 - b. Whites
 - c. Asian Americans
 - d. Native Americans
4. A person's genetic makeup determines whether he or she will develop certain diseases (such as breast cancer), regardless of that person's health habits. True or false?

ANSWERS

1. **B.** Smoking causes about 450,000 deaths per year.
2. **FALSE.** The term *health* refers to the overall condition of the body or mind and to the presence or absence of illness or injury. The term *wellness* refers to optimal health and vitality, encompassing all the dimensions of well-being.
3. **A.** Blacks have the highest age-adjusted death rate of any ethnic group. Whites have the second-highest death rate, followed by Native Americans/Alaska Natives, Hispanics, and Asian Americans/Pacific Islanders.
4. **FALSE.** In many cases, behavior can tip the balance toward good health even when heredity or environment is a negative factor. For example, breast or prostate cancer may run in families, but these diseases are also associated with controllable factors, such as being overweight and inactive.

"How are you?"
"Fine. And you?"
"Fine."
How many times have you had this brief conversation this week—or even today? And how many times have you told someone you were "fine" when in fact you were feeling no better than just all right or even downright miserable? Instead of merely telling people we are "fine," what if we strove to truly feel good—not merely to be free of major illness, but to live life actively, energetically, and fully in a state of optimal personal, interpersonal, and environmental well-being? What if we each took charge of our personal health and wellness? What would it

mean to meet a friend in passing and honestly be able to say, "I'm feeling great"?

WELLNESS: NEW HEALTH GOALS

Generations of people have viewed good health simply as the absence of disease, and that view largely prevails today. The word **health** typically refers to the overall condition of a person's body or mind and to the presence or absence of illness or injury. **Wellness**, a relatively new concept, expands our idea of good health to include living a rich, meaningful, and energetic

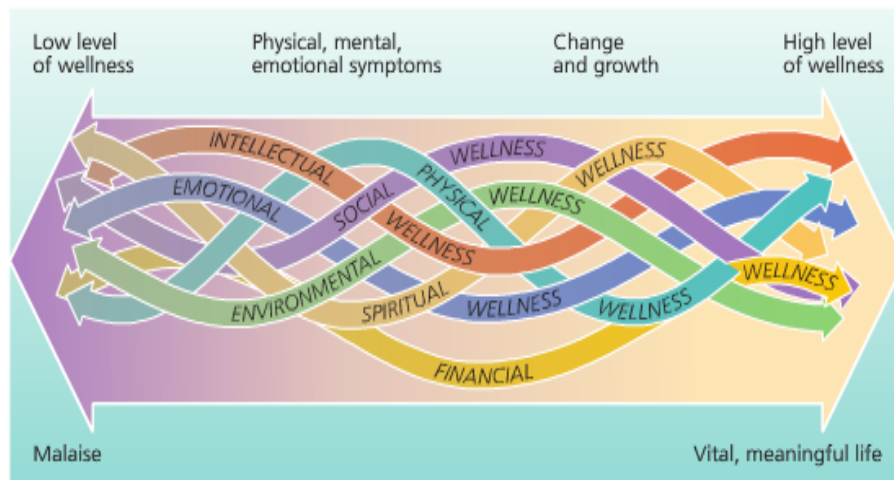


FIGURE 1.1 The wellness continuum.

The concept of wellness includes vitality in seven interrelated dimensions, all of which contribute to overall wellness.

life. Beyond the simple presence or absence of disease, wellness can refer to optimal health and vitality—to living life to its fullest. Although we use the words *health* and *wellness* interchangeably, there are two important differences between them:

- Health—or some aspects of it—can be determined or influenced by factors beyond your control, such as your genes, age, and family history. Consider, for example, a 50-year-old man with a strong family history of early heart disease. These factors increase this man's risk of having a heart attack at an earlier age than might be expected.
- Wellness is determined largely by the decisions you make about how you live. That same 50-year-old man can reduce his risk of an early heart attack by eating sensibly, exercising, and having regular screening tests. Even if he develops heart disease, he may still live a long, rich, meaningful life. This suggests that he should choose to not only care for himself physically but also maintain a positive outlook, enjoy his relationships with others, challenge himself intellectually, and nurture other aspects of his life.

Wellness, therefore, involves our making conscious decisions that affect **risk factors** that contribute to disease or injury. Although age and family history are risk factors we cannot control, behaviors such as smoking, exercising, and eating a healthful diet are well within our control.

The Dimensions of Wellness

Experts have defined seven dimensions of wellness:

- Physical.
- Emotional.
- Intellectual.
- Interpersonal.
- Spiritual.
- Environmental.
- Financial.

These dimensions are interrelated. Each one has an effect on the others. Further, the process of achieving wellness is continuing and dynamic (Figure 1.1), involving change and growth. Wellness is not static. Ignoring any dimension of wellness can be harmful. But the encouraging aspect of wellness is that you can actively pursue it. The following sections briefly introduce the dimensions of wellness. Table 1.1 lists some of the specific qualities and behaviors associated with each dimension.

Physical Wellness Your physical wellness includes not just your body's overall condition and the absence of disease, but your fitness level and your ability to care for yourself. The higher your fitness level is, the higher your level of physical wellness will be. Similarly, as you develop the ability to take care of your own physical needs, you ensure greater physical wellness. To achieve optimum physical wellness, you need to make choices that will help you avoid illnesses and injuries. The decisions you make now, and the habits you develop over your lifetime, will help to determine the length and quality of your life.

Emotional Wellness Trust, self-confidence, optimism, satisfying relationships, and self-esteem are some of the qualities of emotional wellness. Emotional wellness is dynamic, and involves the ups and downs of living. No one can achieve an emotional "high" all the time. Emotional wellness fluctuates with your intellectual, physical, spiritual, social, and interpersonal health. Maintaining emotional wellness requires exploring thoughts and feelings. One of the best ways to

health The overall condition of body or mind and the presence or absence of illness or injury.

wellness Optimal health and vitality, encompassing all the dimensions of well-being.

risk factor A condition that increases one's chances of disease or injury.

TERMS

Table 1.1**Examples of Qualities and Behaviors Associated with the Dimensions of Wellness**

PHYSICAL	EMOTIONAL	INTELLECTUAL	INTERPERSONAL	SPIRITUAL	ENVIRONMENTAL	FINANCIAL
■ Eating well ■ Exercising ■ Avoiding harmful habits ■ Practicing safe sex ■ Recognizing symptoms of disease ■ Getting regular checkups ■ Avoiding injuries	■ Optimism ■ Trust ■ Self-esteem ■ Self-acceptance ■ Self-confidence ■ Ability to understand and accept one's feelings ■ Ability to share feelings with others	■ Openness to new ideas ■ Capacity to question ■ Ability to think critically ■ Motivation to master new skills ■ Sense of humor ■ Creativity ■ Curiosity ■ Lifelong learning	■ Communication skills ■ Capacity for intimacy ■ Ability to establish and maintain satisfying relationships ■ Ability to cultivate support system of friends and family	■ Capacity for love ■ Compassion ■ Forgiveness ■ Altruism ■ Joy ■ Fulfillment ■ Caring for others ■ Sense of meaning and purpose ■ Sense of belonging to something greater than oneself	■ Having abundant, clean natural resources ■ Maintaining sustainable development ■ Recycling whenever possible ■ Reducing pollution and waste	■ Basic understanding of how money works ■ Living within one's means ■ Avoiding debt, especially for unnecessary items ■ Save for the future and for potential emergencies

achieve emotional wellness is to share your emotional problems with others. If it's a risk, it's a risk worth taking. Achieving emotional wellness means finding solutions to emotional problems, with professional help if necessary.

Intellectual Wellness Those who enjoy intellectual wellness constantly challenge their minds. An active mind is essential to wellness because it detects problems, finds solutions, and directs behavior. Throughout their lifetimes people who enjoy intellectual wellness never stop learning. They not only seek and relish new experiences and challenges but often discover new things about themselves.

Interpersonal Wellness Satisfying and supportive relationships are important to physical and emotional wellness. Learning good communication skills, developing the capacity for intimacy, and cultivating a supportive network are all important to interpersonal (or social) wellness. Social wellness requires participating in and contributing to your community and to society.

Spiritual Wellness To enjoy spiritual wellness is to possess a set of guiding beliefs, principles, or values that give meaning and purpose to your life, especially in difficult times. The spiritually well person focuses on the positive aspects of life and finds spirituality to be an antidote for negative feelings such as cynicism, anger, and pessimism. Organized religions help many people develop spiritual health. Religion, however, is not the only source or form of spiritual wellness. Many people find meaning and purpose in their lives on their own—through nature, art, meditation, or good works—or with their loved ones.

Environmental Wellness Your environmental wellness is defined by the livability of your surroundings. Personal

health depends on the health of the planet—from the safety of the food supply to the degree of violence in society. Your physical environment can support your wellness or diminish it. To improve your environmental wellness, you can learn about and protect yourself against hazards in your surroundings and work to make your world a cleaner and safer place.

Financial Wellness Financial wellness refers to your ability to live within your means and manage your money in a way that gives you peace of mind. It includes balancing your income and expenses, staying out of debt, saving for the future, and understanding your emotions about money. For more on this topic, see the “Financial Wellness” box.

Other Aspects of Wellness Many experts consider occupational wellness to be an additional important dimension of wellness. *Occupational wellness* refers to the level of happiness and fulfillment you gain through your work. Although high salaries and prestigious titles are gratifying, they alone may not bring about occupational wellness. An occupationally well person enjoys his or her work, feels a connection with others in the workplace, and takes advantage of the opportunities to learn and be challenged. Other important aspects of occupational wellness include job satisfaction and recognition from managers and colleagues. An ideal job draws on your interests and passions, as well as your vocational skills, and allows you to feel that you are making a contribution in your everyday work.

To achieve occupational wellness, set career goals that reflect your personal values. For example, a career in sales might be a good choice for someone who values financial security, whereas a career in teaching or nursing might be a good choice for someone who values service to others.



With the news full of stories of home foreclosures, credit card debt, and personal bankruptcies, it has become painfully clear that many Americans do not know how to manage their finances. You can avoid such stress—and gain financial peace of mind—by developing skills that contribute to financial wellness.

Financial wellness means having a healthy relationship with money. It involves knowing how to manage your money, using self-discipline to live within your means, using credit cards wisely, staying out of debt, meeting your financial obligations, having a long-range financial plan, and saving.

Learn to Budget

Although the word *budget* may conjure up thoughts of deprivation, a budget is really just a way of tracking where your money goes and making sure you're spending it on the things that are most important to you. To start one, list your monthly income and your expenditures. If you aren't sure where you spend your money, track your expenses for a few weeks or a month. Then organize them into categories, such as housing, food, transportation, entertainment, services, personal care, clothes, books and school supplies, health care, credit card and loan payments, and miscellaneous. Use categories that reflect the way you actually spend your money. Knowing where your money goes is the first step in gaining control of it.

Now total your income and expenditures. Are you taking in more than you spend, or vice versa? Are you surprised by your spending patterns? Use this information to set guidelines and goals for yourself. If your expenses exceed your income, identify ways to make some cuts. If you have both a cell phone and a land line, for example, consider whether you can give one up. If you spend money on movies and restaurants, consider less expensive options like having a weekly game night with friends or organizing an occasional potluck.

Be Wary of Credit Cards

College students are prime targets for credit card companies, and most undergraduates have at least one card. In fact, many college students use credit cards to live beyond their means, not just for convenience. According a recent report, half of all students have four or more cards, and the average outstanding balance on undergraduate credit cards is over \$3000.

The best way to avoid credit card debt is to have just one card, to use it only when necessary, and to pay off the entire balance every month. Make sure you understand terms like *APR* (annual percentage rate—the interest you're charged on your balance), *credit limit* (the maximum amount you can borrow), *minimum monthly payment* (the smallest payment your creditor will accept each month), *grace period* (the number of days you have to pay

your bill before interest or penalties are charged), and *over-the-limit* and *late fees* (the amount you'll be charged if your payment is late or if you go over your credit limit).

Get Out of Debt

If you have credit card debt, stop using your cards and start paying them off. If you can't pay the whole balance, at least try to pay more than the minimum payment each month. It can take a very long time to pay off a loan by making only the minimum payments. For example, paying off a credit card balance of \$2000 at 10% interest with monthly payments of \$20 would take 203 months—17 years. To see for yourself, check out an online credit card calculator like <http://cgi.money.cnn.com/tools/debtplanner/debtplanner.jsp>. And remember: By carrying a balance and incurring finance charges, you are also paying back much more than your initial loan.

Start Saving

The same miracle of compound interest that locks you into years of credit card debt can work to your benefit if you start saving early (for an online compound interest calculator, visit <http://www.interestcalc.org>). Experts recommend “paying yourself first” every month—that is, putting some money into savings before you start paying your bills, depending on what your budget allows. You may want to save for a large purchase, or you may even be looking ahead to retirement. If you work for a company with a 401(k) retirement plan, contribute as much as you can every pay period.

Become Financially Literate

Although modern life requires financial literacy, most Americans have not received any kind of basic financial training. For this reason, the U.S. government has established the Financial Literacy and Education Commission (www.MyMoney.gov) to help Americans develop financial literacy and learn how to save, invest, and manage their money better. The consensus is that developing lifelong financial skills should begin in early adulthood, during the college years, if not earlier.

SOURCES: Federal Deposit Insurance Corporation. 2010. *Money Smart: A Financial Education Program* (<http://www.fdic.gov/consumers/consumer/moneysmart/young.html>); Plymouth State University. 2012. *Student Monetary Awareness and Responsibility Today!* (<http://www.plymouth.edu/office/financial-aid/smart/>); U.S. Financial Literacy and Education Commission. 2012. *MyMoney.gov* (<http://www.mymoney.gov>).

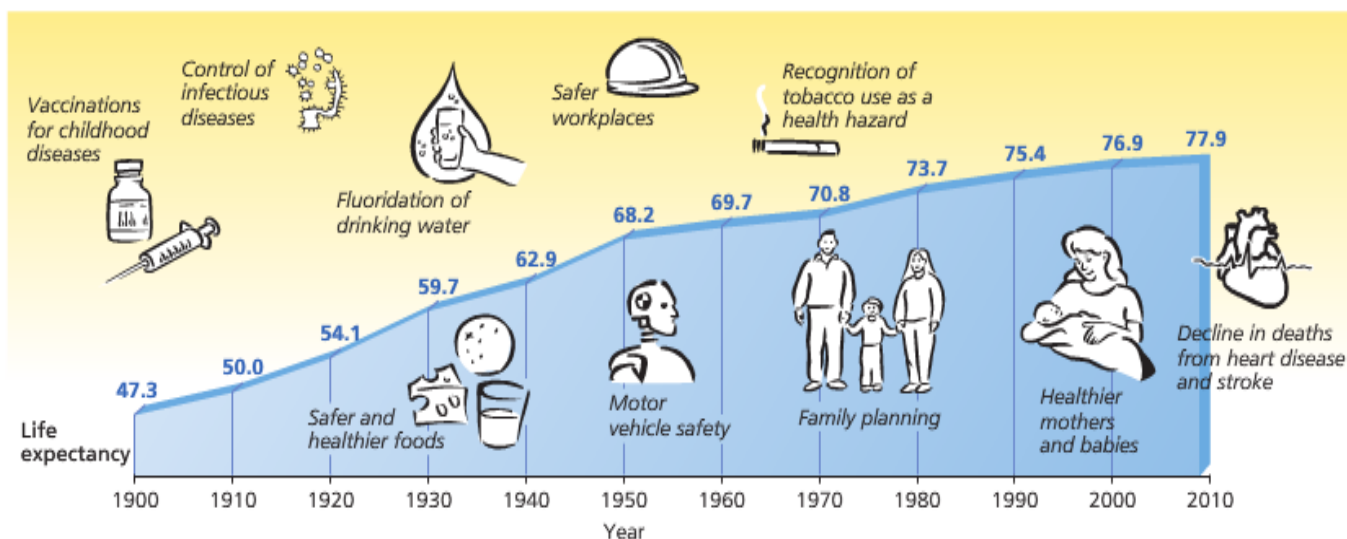


FIGURE 1.2 Public health achievements of the past century. From 1900 to 2000, public health achievements greatly improved Americans' quality of life and dramatically reduced the number of deaths from infectious diseases. In 2010 federal health care legislation mandated health insurance coverage for millions of uninsured Americans and instituted consumer-oriented reforms of the U.S. health care industry.

SOURCES: Centers for Disease Control and Prevention, Ten great public health achievements—United States, 1900–1999. *Morbidity and Mortality Weekly Report* 48(50): 1141; U.S. Department of Health and Human Services. 2012. *HealthCare.gov: Take Health Care into Your Own Hands* (<http://www.healthcare.gov>).

New Opportunities for Taking Charge

Wellness is a fairly new concept. A century ago, Americans considered themselves lucky just to survive to adulthood (Figure 1.2). A child born in 1900, for example, could expect to live only about 47 years.

Morbidity and mortality rates (rates of illness and death, respectively) from common **infectious diseases** (such as pneumonia, tuberculosis, and diarrhea) were much higher than Americans experience today.

Since 1900, **life expectancy** has nearly doubled, due largely to the development of vaccines and antibiotics to fight infections, and to public health measures such as water purification and sewage treatment to improve living conditions. But even though life expectancy has increased, poor health will limit most Americans' activities during the last 15% of their

QUICK STATS

72% of American men are overweight.

—NIH, 2011

lives, resulting in some sort of **impaired life** (Figure 1.3). Today a different set of diseases has emerged as our major health threat, and heart disease, cancer, and stroke are now the three leading causes of death for Americans (Table 1.2). Treating such **chronic diseases** is costly and difficult.

The good news is that people have some control over whether they develop chronic diseases. People make choices every day that increase or decrease their risks for such diseases. Each of us can take personal responsibility for **lifestyle choices** that include behaviors such as smoking, diet, exercise, and alcohol use. As Table 1.3 makes clear, lifestyle

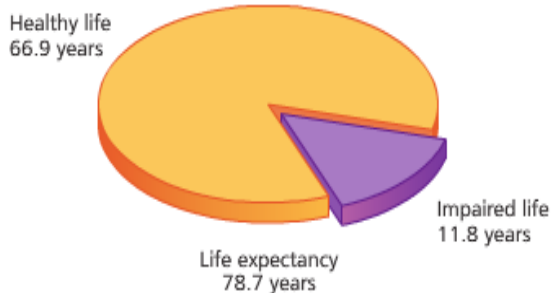


FIGURE 1.3 Quantity of life versus quality of life. Years of healthy life as a proportion of life expectancy in the U.S. population.

SOURCE: National Center for Health Statistics. 2012. Deaths: Preliminary data for 2010 (data release). *National Vital Statistics Report* 60(4).

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morbidity rate The relative incidence of disease among a population.

mortality rate The number of deaths in a population in a given period of time; usually expressed as a ratio, such as 75 deaths per 1000 members of the population.

infectious disease A disease that can spread from person to person, caused by microorganisms such as bacteria and viruses.

life expectancy The period of time a member of a given population is expected to live.

impaired life The period of a person's life when he or she may not be able to function fully due to disease or disability.

chronic disease A disease that develops and continues over a long period of time, such as heart disease or cancer.

lifestyle choice A conscious behavior that can increase or decrease a person's risk of disease or injury; such behaviors include smoking, exercising, eating a healthful diet, and others.

Table 1.2 Leading Causes of Death in the United States, 2010

RANK	CAUSE OF DEATH	NUMBER OF DEATHS	PERCENTAGE OF TOTAL DEATHS*	DEATH RATE†	LIFESTYLE FACTORS
	All causes	2,465,932	100.0	798.7	
1	Heart disease	599,444	24.3	192.9	D I S A
2	Cancer	573,855	23.3	185.9	D I S A
3	Chronic lower respiratory diseases	137,789	5.6	44.6	■ ■ S ■
4	Stroke	129,180	5.2	41.8	D I S A
5	Unintentional injuries (accidents)	118,043	4.9	38.2	■ I S A
6	Alzheimer's disease	83,308	3.8	27.0	■ ■ ■ ■
7	Diabetes mellitus	68,905	2.8	22.3	D I S ■
8	Kidney disease	50,472	2.1	16.3	D I S A
9	Influenza and pneumonia	50,003	2.0	16.2	■ ■ S ■
10	Intentional self-harm (suicide)	37,793	1.5	12.2.9	■ ■ ■ A
11	Septicemia (systemic blood infection)	34,843	1.4	11.3	■ ■ ■ A
12	Chronic liver disease and cirrhosis	31,802	1.3	10.34	■ ■ ■ A
13	Hypertension (high blood pressure)	26,577	1.1	8.6	D I S A
14	Parkinson's disease	21,963	0.8	7.1	■ ■ ■ ■
15	Pneumonitis due to solids and liquids	17,001	0.7	5.5	■ ■ ■ A
	All other causes	488,954	19.0	158.5	■ ■ ■ ■

Key **D** Diet plays a part. **S** Smoking plays a part.
 I Inactive lifestyle plays a part. **A** Excessive alcohol use plays a part.

NOTE: Although not among the overall top 15 causes of death, HIV/AIDS (8,352 deaths in 2010) is a major killer. In 2010 HIV/AIDS was the 11th leading cause of death for Americans aged 15–24 years and the 7th leading cause of death for those aged 25–44 years.

*Percentages may not sum to 100% due to rounding.
 † Age-adjusted death rate per 100,000 persons.

SOURCE: National Center for Health Statistics. 2012. Deaths: Preliminary data for 2010 (data release). *National Vital Statistics Report* 60(4).

factors contribute to many deaths in the United States, and people can influence their own health risks.

The need to make good choices is especially true for teens and young adults. For Americans aged 15–24, for example, the top three causes of death are unintentional injuries (accidents), homicide, and suicide (Table 1.4).

Promoting Health and Preventing Disease

People are a nation's most important resource. The creativity, vitality, and prosperity of a country depend on the health of its people. Governments as well as communities find it in their long-term interests to promote health and prevent disease. The World Health Organization (WHO) defines **health promotion** as "the process of enabling people to increase control over their health and its determinants, and thereby improve their

health." The primary means of promoting health are public health policies and agencies that identify and discourage unhealthy and high-risk behaviors and that encourage and provide incentives for judicious health behaviors. Many college campuses have health promotion programs or activities.

In the United States, the National Institutes of Health (NIH) and the Centers for Disease Control and Prevention (CDC) are federal agencies charged with promoting the public's health. NIH is the primary federal agency for conducting and supporting medical research. NIH scientists investigate ways to prevent disease as well as the causes, treatments,

health promotion The process of enabling people to increase control over their health and its determinants, and thereby improve their health.

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Table 1.3

Key Contributors to Death among Americans

	NUMBER OF DEATHS PER YEAR	PERCENTAGE OF TOTAL DEATHS PER YEAR
Tobacco	443,000	18.0
Obesity*	111,909	4.5
Alcohol consumption	25,440	1.0
Microbial agents	50,003	2.0
Toxic agents	55,000	2.3
Motor vehicles	35,080	1.4
Firearms	11,015	0.5
Sexually transmitted diseases	20,000	0.8
Illicit drug use	37,792	1.5

NOTE: The factors listed here are defined as lifestyle and environmental factors that contribute to the leading killers of Americans. Microbial agents include bacterial and viral infections like influenza and pneumonia; toxic agents include environmental pollutants and chemical agents such as asbestos.

*The number of deaths due to obesity is an area of ongoing controversy and research. Recent estimates have ranged from 112,000 to 365,000.

SOURCES: Centers for Disease Control and Prevention. 2008. Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000–2004. *Morbidity and Mortality Weekly Report* 57(45): 1226–1228; Flegal, K. M. 2010. *Supplemental Analyses for Estimates of Excess Deaths Associated with Underweight, Overweight, and Obesity in the U.S. Population* (http://www.cdc.gov/nchs/data/hestat/excess_deaths/excess_deaths.htm); National Center for Health Statistics. 2012. Deaths: final data for 2009 (data release). *National Vital Statistics Report* 60(3); National Center for Health Statistics. 2012. Deaths: preliminary data for 2010 (data release). *National Vital Statistics Report* 60(4).

Disease prevention is a major focus of public health promotion. Working at disease prevention, the CDC collaborates with partners throughout the nation and the world to provide tools that people and communities need to protect their health through health promotion; prevention of disease, injury, and disability; and preparedness for new health threats. Prevention research focuses on identifying risk factors and protective factors for diseases, disorders, and injuries; identifying high-risk behaviors; and developing, managing, and evaluating preventive interventions.

The Healthy People Initiative

The national Healthy People initiative aims to prevent disease and improve Americans' quality of life. *Healthy People* reports, published each decade since 1980, set national health goals based on 10-year agendas. The initiative's most recent iteration, *Healthy People 2020*, was developed in 2008–2009 and released to the public in 2010. *Healthy People 2020* envisions "a society in which all people live long, healthy lives" and proposes the eventual achievement of the following broad national health objectives:

- **Eliminate preventable disease, disability, injury, and premature death.** This objective involves activities such as taking more concrete steps to prevent diseases and injuries among individuals and groups, promoting healthy lifestyle choices, improving the nation's preparedness for emergencies, and strengthening the public health infrastructure.
- **Achieve health equity, eliminate disparities, and improve the health of all groups.** This objective involves identifying, measuring, and addressing health differences between individuals or groups that result from a social or economic disadvantage.

and cures for common and rare diseases. Composed of 27 institutes and centers, the NIH provides leadership and financial support to researchers in every state as well as around the world. The NIH translates research results into interventions and communicates research findings to patients, health care providers, and the public.

disease prevention The process of providing tools that people and communities need to protect their health by reducing risks; promoting health; preventing disease, injury, and disability; and preparing for new health threats.

TERMS

VITAL STATISTICS

Table 1.4

Leading Causes of Death among Americans Aged 15–24

RANK	CAUSE OF DEATH	NUMBER OF DEATHS	PERCENTAGE OF TOTAL DEATHS
1	Accidents:	12,015	40.7
	Transport	7,209	24.4
	Nontransport	4,806	16.3
2	Homicide	4,651	15.8
3	Suicide	4,559	15.5
4	Cancer	1,594	5.4
5	Heart disease	984	3.3
	All causes	29,504	

SOURCE: National Center for Health Statistics. 2012. Deaths: Preliminary data for 2010. *National Vital Statistics Report* 60(4).

Table 1.5 Selected *Healthy People 2020* Objectives

OBJECTIVE	ESTIMATE OF CURRENT STATUS (%)	GOAL (%)
Reduce the proportion of adults who are sedentary and engage in no leisure-time physical activity.	36.2	32.6
Increase the proportion of adults who are at a healthy weight.	30.8	33.9
Increase the proportion of adults with mental health disorders who receive treatment.	58.7	64.6
Reduce the proportion of adults who use cigarettes.	20.6	12.0
Increase the proportion of adults who get sufficient sleep.	69.6	70.9
Reduce the proportion of adults with hypertension.	29.9	26.9
Reduce the proportion of adults who drank excessively in the previous 30 days.	28.1	25.3
Increase the proportion of persons who use the Internet to communicate with their health care providers.	13	15
Increase the proportion of persons with health insurance.	83	100

SOURCE: Institute of Medicine. 2011. *Leading Health Indicators for Healthy People 2020*. Washington, DC: The National Academies Press.

- **Create social and physical environments that promote good health for all.** This objective involves the use of health interventions at many different levels (such as anti-smoking campaigns by schools, workplaces, and local agencies), improving the situation of undereducated and poor Americans by providing a broader array of educational and job opportunities, and actively developing healthier living and natural environments for everyone.
- **Promote healthy development and healthy behaviors across every stage of life.** This objective involves taking a cradle-to-grave approach to health promotion by encouraging disease prevention and healthy behaviors in Americans of all ages.

In a shift from the past, *Healthy People 2020* emphasizes the importance of health determinants—factors that affect the health of individuals, demographic groups, or entire populations. Health determinants are social (including factors such as ethnicity, education level, or economic status) and environmental (including natural and human-made environments). Thus one goal is to improve living conditions in ways that reduce the impact of negative health determinants.

Examples of individual health promotion goals from *Healthy People 2020*, along with estimates of how well Americans are tracking toward achieving those goals, appear in Table 1.5.

Health Issues for Diverse Populations

Americans are a diverse people. Our ancestry is European, African, Asian, Pacific Islander, Latin American, and Native American. We live in cities, suburbs, and rural areas and work in every imaginable occupation.

When it comes to health, most differences among people are insignificant; most health issues concern us all equally. We all need to eat well, exercise, manage stress, and cultivate satisfying personal relationships. We need to know how to

When it comes to wellness, personal responsibility can make the difference.

protect ourselves from heart disease, cancer, sexually transmitted diseases, and injuries. We need to know how to use the health care system.

But some of our differences, as individuals and as members of groups, have important implications for health. Some of us, for example, have a genetic predisposition for developing certain health problems, such as high cholesterol. Some of us have grown up eating foods that raise our risk of heart disease or obesity. Some of us live in an environment that increases the chance that we will smoke cigarettes or abuse alcohol. These health-related differences among individuals and groups can be biological—that is, determined genetically—or cultural—acquired as patterns of behavior through daily interactions with our families, communities, and society. Many health conditions are a function of biology and culture combined. A person can have a genetic predisposition for a disease, for example, but won't actually develop the disease itself unless certain lifestyle factors are present, such as tobacco use or a poor diet.

Health-related differences among groups can be identified and described in the context of several different dimensions. Those highlighted by the Healthy People initiative are gender, ethnicity, income and education, disability, geographic location, and sexual orientation.

Sex and Gender Sex and gender profoundly influence wellness. The WHO defines **sex** as the biological and physiological characteristics that define men and women. These characteristics are related to chromosomes and their effects on reproductive organs and the functioning of the body. Menstruation in women and the presence of testicles in men are examples of sex-related characteristics.

sex The biological and physiological characteristics that define men and women.

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Gender is defined as roles, behaviors, activities, and attributes that a given society considers appropriate for men and women. A person's gender is rooted in biology and physiology, but it is shaped by experience and environment—how society responds to individuals based on their sex. Examples of gender-related characteristics that affect wellness include higher rates of smoking and drinking among men and lower earnings among women (compared with men doing similar work).

Both sex and gender have important effects on wellness, but they can be difficult to separate (see Table 1.6). For example, in the

QUICK STATS

One in three American men and one in five American women have no regular health care provider.

early 20th century, more women began smoking with changes in culturally defined ideas about women's behavior (a gender issue). Because women are more vulnerable to the toxins in tobacco smoke (a sex issue), their cancer rates also increased. Although men are more biologically likely than women to suffer from certain diseases (a sex issue), men are less likely to visit their physicians for regular exams (a gender issue). As a result, 55% of American men have not seen their doctors for checkups in the past year, and 29% of men say they wait as long as possible before seeing a doctor—even when they are sick. About

one in three American men don't have a regular health care provider, compared to about one in five American women.

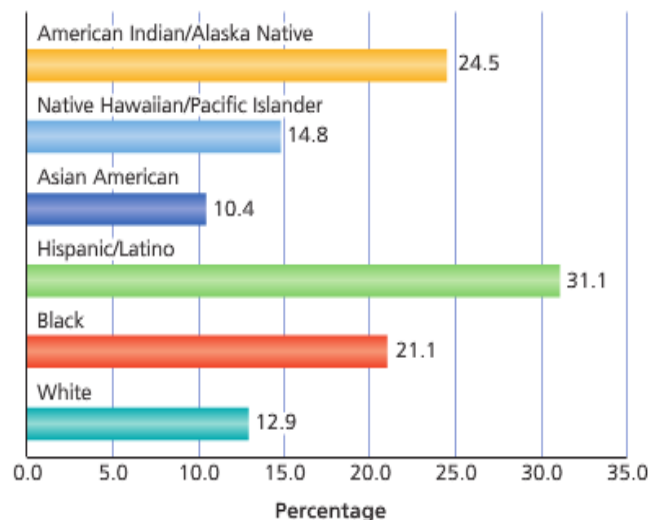
gender The roles, behaviors, activities, and attributes that a given society considers appropriate for men and women.

TERMS

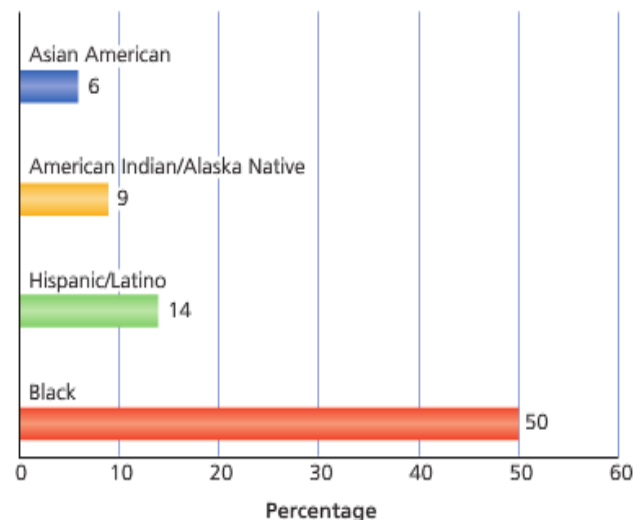
Ethnicity Compared with the U.S. population as a whole, American ethnic minorities have higher rates of death and

Table 1.6 Women's Health, Men's Health

HEALTH ISSUES	WOMEN	MEN
<i>Life expectancy</i>	On average, live about five years longer but have higher rates of disabling health problems such as arthritis, osteoporosis, and Alzheimer's disease.	Have a shorter life expectancy but lower rates of disabling health problems.
<i>Height and weight</i>	Shorter on average, with a lower proportion of muscle; tend to have a "pear" shape with excess body fat stored in the hips; obesity is more common in women than men.	Taller on average, with a higher proportion of muscle; tend to have an "apple" shape with excess body fat stored in the abdomen.
<i>Skills and fluencies</i>	Score better on tests of verbal fluency, speech production, fine motor skills, and visual and working memory.	Score better on tests of visual-spatial ability (such as the ability to imagine the relationships between shapes and objects when rotated in space).
<i>Heart attacks</i>	Experience heart attacks about 10 years later than men, on average, with a poorer 1-year survival rate; more likely to experience atypical heart attack symptoms (such as fatigue and difficulty breathing) or "silent" heart attacks that occur without chest pain.	Experience heart attacks about 10 years earlier than women, on average, with a better 1-year survival rate; more likely to have "classic" heart attack symptoms (such as chest pain).
<i>Stroke</i>	More likely to have a stroke or die from one, but also more likely to recover language ability after a stroke that affects the left side of the brain.	Less likely to die from a stroke, but also more likely to suffer permanent loss of language ability after a stroke that affects the left side of the brain.
<i>Immune response</i>	Stronger immune systems; less susceptible to infection by certain bacteria and viruses, but more likely to develop autoimmune diseases such as lupus.	Weaker immune systems; more susceptible to infection by certain bacteria and viruses, but less likely to develop autoimmune diseases.
<i>Smoking</i>	Lower rates of smoking than men, but higher risk of lung cancer at a given level of exposure to smoke.	Higher rates of smoking and spit tobacco use.
<i>Alcohol</i>	Become more intoxicated at a given level of alcohol intake.	Become less intoxicated at a given level of alcohol intake, but are more likely to use or abuse alcohol or to develop alcoholism.
<i>Stress</i>	More likely to react to stress with a "tend-and-befriend" response that involves social support; may have a longevity advantage because of a reduced risk of stress-related disorders.	More likely to react to stress with aggression or hostility; this pattern may increase the rate of stress-related disorders.
<i>Depression</i>	More likely to suffer from depression and to attempt suicide.	Lower rates of depression than women and less likely to attempt suicide, but four times more likely to succeed at suicide.
<i>Headaches</i>	More commonly suffer migraines and chronic tension headaches.	More likely to suffer from cluster headaches.
<i>Sexually transmitted diseases (STDs)</i>	More likely to be infected with an STD during a heterosexual encounter; more likely to suffer severe, long-term effects from STDs, such as chronic infection and infertility.	Less likely to be infected with an STD during a heterosexual encounter.



(a) Americans self-reporting health status as fair or poor



(b) Ethnic groups receiving worse health care than white Americans, based on key core measures

FIGURE 1.4 Self-rated health status and quality of care. White Americans are less likely than most ethnic minorities to report their health status as being fair or poor. Meanwhile, significant percentages of minority groups receive lower-quality health care than white Americans, based on comparisons of key measures of treatment quality.

SOURCES: Centers for Disease Control and Prevention. 2008. Racial/ethnic disparities in self-rated health status among adults with and without disabilities—United States, 2004–2006. *Morbidity and Mortality Weekly Report* 57(39): 1069–1073; U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality. 2010. 2009 *National Healthcare Disparities Report*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality, AHRQ Pub. No. 10-0003.

disability from many causes (Figure 1.4). These disparities result from a complex mix of genetic variations, environmental factors, and health behaviors.

Some diseases are concentrated in certain gene pools, the result of each ethnic group's relatively distinct history. Sickle-cell disease is most common among people of African ancestry. Tay-Sachs disease afflicts people of Eastern European Jewish heritage and French Canadian heritage. Cystic fibrosis is more common among Northern Europeans. In addition to biological differences, many cultural differences occur along ethnic lines. Ethnic groups may vary in their traditional diets; their family and interpersonal relationships; their attitudes toward tobacco, alcohol, and other drugs; and their health beliefs and practices. All of these factors have implications for wellness.

The federal government collects population and health information on five broad ethnic minority groups in American society. Each group has some specific health concerns:

- *Latinos* are a diverse group, with roots in Mexico, Puerto Rico, Cuba, and South and Central America. Many Latinos are of mixed Spanish and American Indian descent or of mixed Spanish, Indian, and African American descent. Latinos on average have lower rates of heart disease, cancer, and suicide than the general population, but higher rates of infant mortality and a higher overall birth rate; other areas of concern include gallbladder disease and obesity. At current rates, about one in two Latinas will develop diabetes in her lifetime.
- *African Americans* have the same leading causes of death as the general population, but they have a higher

infant mortality rate and lower rates of suicide and osteoporosis. Health issues of special concern for African Americans include high blood pressure, stroke, diabetes, asthma, and obesity. African American men are at significantly higher risk of prostate cancer than men in other groups, and early screening is recommended for them.

- *Asian Americans* include people who trace their ancestry to countries in the Far East, Southeast Asia, or the Indian subcontinent, including Japan, China, Vietnam, Laos, Cambodia, Korea, the Philippines, India, and Pakistan. Asian Americans have a lower death rate and a longer life expectancy than the general population. They have lower rates of coronary heart disease and obesity. However, health differences exist among these groups. For example, Southeast Asian men have higher rates of smoking and lung cancer, and Vietnamese American women have higher rates of cervical cancer.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How often do you feel exuberant? Vital? Joyful? What makes you feel that way? Conversely, how often do you feel downhearted, de-energized, or depressed? What makes you feel that way? Have you ever thought about how you might increase experiences of vitality and decrease experiences of discouragement?



DIVERSITY MATTERS

Health Disparities among Ethnic Minorities

Among America's ethnic groups, striking disparities exist in health status, access to and quality of health care, and life expectancy.

For example, the estimated life expectancy of black Americans (75.1) is about four years shorter than that of whites (79.0). Blacks also have the highest age-adjusted death rate (898 deaths per 100,000 population) of any ethnic group. Whites have the second-highest death rate (741), followed by Native Americans/Alaska Natives (626), Hispanics (558), and Asian Americans/Pacific Islanders (424).

In studying and attempting to understand the underlying causes of health disparities, it is often helpful to separate the many potential contributing factors.

Income and Education As noted earlier, poverty and low educational attainment are the most important factors underlying health disparities. However, when groups with similar incomes and levels of education are compared, ethnic disparities persist. Consider the following examples:

- **Overall health.** People living in poverty report worse health than people with higher incomes. Within the latter group, however, African Americans and Latinos rate their health as “bad” more frequently than do whites.
- **Infant mortality.** Rates of infant deaths go down as the education level of mothers goes up. Among mothers who are college graduates, however, African Americans have significantly higher rates of infant mortality than whites, Latinos, and Asian Americans. Overall, the rate of infant mortality among blacks is more than double that of whites, Asian Americans, or Hispanics.

Access to Appropriate Health Care The health care reform bill passed by Congress in 2010 mandated insurance coverage for 32 million Americans without



insurance. Major coverage expansion begins in 2014. The legislation should reduce the number of people without access to health care and without information about services and preventive care.

Although people with low incomes have tended to receive poorer-quality health care, disparities among ethnic minorities persist even at higher income levels. For example, among nonpoor Americans, many more Latinos than whites or African Americans report no usual source of health care and no health care visits within the past year. Ongoing studies continually find that racial minorities have less access to better health care (such as complex surgery at high-volume hospitals) and receive lower-quality care than whites.

Factors affecting such disparities may include the following:

- **Local differences in the availability of high-tech health care and specialists.** Minorities, regardless of income, may be more likely to live in medically underserved areas.
- **Problems with communication and trust.** People whose primary language is not English are more likely to be uninsured and to have trouble communicating with health care providers. They may also have problems interpreting health information from public health education campaigns. Language and cultural barriers may be compounded by an underrepresentation of minorities in the health professions.

- **Cultural preferences relating to health care.** Groups may vary in their assessment of when it is appropriate to seek medical care and what types of treatments are acceptable.

Culture and Lifestyle As described in the chapter, ethnic groups may vary in health-related behaviors such as diet, tobacco and alcohol use, coping strategies, and health practices—and these behaviors can have important implications for wellness, both positive and negative. For example, African Americans are more likely to report consuming five or more servings of fruits and vegetables per day than people from other ethnic groups. American Indians report high rates of smoking and smoking-related health problems.

Cultural background can be an important protective factor. For example, poverty is strongly associated with increased rates of depression, but some groups, including Americans born in Mexico or Puerto Rico, have lower rates of mental disorders at a given level of income and appear to have coping strategies that provide special resilience.

Discrimination Racism and discrimination are stressful events that can cause psychological distress and increase the risk of physical and psychological problems. Discrimination can contribute to lower socioeconomic status and its associated risks. Bias in medical care can directly affect treatment and health outcomes.

Conversely, research shows that better health care results when doctors ask patients detailed questions about their ethnicity. (Most medical questionnaires ask patients to put themselves in a vague racial or ethnic category, such as Asian or Caucasian.) Armed with more information about patients' backgrounds, medical professionals may find it easier to detect some genetic diseases or to overcome language or cultural barriers.

- **American Indians and Alaska Natives** typically embrace a tribal identity, such as Sioux, Navaho, or Hopi. American Indians and Alaska Natives have lower death rates from heart disease, stroke, and cancer than the general population, but they have higher rates of early death from causes linked to smoking and alcohol use, including injuries and cirrhosis. Diabetes is a special concern for many groups; for example, the Pimas of Arizona have the highest known prevalence of diabetes of any population in the world.
- **Native Hawaiian and other Pacific Islander Americans** trace their ancestry to the original peoples of Hawaii, Guam, Samoa, and other Pacific Islands. Pacific Islander Americans have a higher overall death rate than the general population and higher rates of diabetes and asthma. Smoking and obesity are special concerns for this group.

Disparities extend beyond health and into health care. According to the annual *National Healthcare Disparities Report* published by the U.S. Department of Health and Human Services, ethnic minorities and poor Americans consistently report their health as being less than very good, and receive lower-quality health services than do white or more affluent Americans. Although health care inequity is being addressed on the public and private fronts, and progress has been made, medical disparities still contribute to higher disease and death rates for many ethnic Americans. (See the “Health Disparities among Ethnic Minorities” box for more information.)

Income and Education Inequalities in income and education underlie many of the health disparities among Americans. In fact, poverty and low educational attainment are far more important predictors of poor health than any ethnic factor. Income and education are closely related, and groups with the highest poverty rates and least education have the worst health status. These Americans have higher rates of infant mortality, traumatic injury, violent death, and many diseases, including heart disease, diabetes, tuberculosis, HIV infection, and some cancers. They are more likely to eat poorly, be overweight, smoke, drink, and use drugs. They are exposed to more day-to-day stressors and have less access to health care services.

Disability People with disabilities have activity limitations, need assistance, or perceive themselves as having a disability. About one in five people in the United States has some level of disability, and the rate is rising, especially among younger segments of the population. People with disabilities are more likely to be inactive and overweight. They report more days of depression than people

without disabilities. Many also lack access to health care services.

Geographic Location About one in four Americans currently lives in a rural area—a place with fewer than 10,000 residents. People living in rural areas are less likely to be physically active, to use safety belts, or to obtain screening tests for preventive health care. They have less access to timely emergency services and much higher rates of some diseases and injury-related death than people living in urban areas. They are also more likely to lack health insurance. Children living in dangerous neighborhoods—rural or urban—are four times more likely to be overweight than children living in safer areas.

Sexual Orientation The 1–5% of Americans who identify themselves as homosexual or bisexual make up a diverse community with varied health concerns. Their emotional wellness and personal safety are affected by factors relating to personal, family, and social acceptance of their sexual orientation. Gay, lesbian, bisexual, and transgender teens are more likely to engage in risky behaviors such as unsafe sex and drug use; they are also more likely to be depressed and to attempt suicide. HIV/AIDS is a major concern for gay men, and gay men and lesbians may have higher rates of substance abuse, depression, and suicide.

CHOOSING WELLNESS

Wellness is something everyone can have. Achieving it requires knowledge, self-awareness, motivation, and effort, but the benefits last a lifetime. Optimal health comes mostly from a healthy lifestyle—patterns of behavior that promote and support your health now and as you get older. In the pages that follow, you’ll find current information and suggestions you can use to build a healthier lifestyle; also, see the “Wellness Matters for College Students” box.

Factors That Influence Wellness

Our behavior, family health history, environment, and access to health care are all important influences on wellness. These factors, which vary for both individuals and groups, can interact in ways that produce either health or disease.

Health Habits Research continually reveals new connections between our habits and health. For example, heart disease is associated with smoking, stress, a hostile attitude, a poor diet, and being sedentary. Poor health habits take hold before many Americans reach adulthood.

QUICK STATS

For 75% of measured criteria, poor Americans typically receive lower-quality health care than more affluent Americans.

—National Healthcare Disparities Report, 2010



WELLNESS ON CAMPUS

Wellness Matters for College Students

If you are like most college students, you probably feel pretty good about your health right now. Most college students are in their late teens or early twenties, lead active lives, have plenty of friends, and look forward to a future filled with opportunity. With all these things going for you, why shouldn't you feel good?

A Closer Look

Although most college-age people look healthy, appearances can be deceiving. Each year, thousands of students lose productive academic time to physical and emotional health problems—some of which can continue to plague them for life.

The following table shows the top 10 health issues affecting students' academic performance, according to the Spring 2011 American College Health Association–National College Health Assessment II.

HEALTH ISSUE	STUDENTS AFFECTED (%)
Stress	27.5
Sleep difficulties	19.4
Anxiety	19.1
Cold/flu/sore throat	16.4
Work	13.3
Internet use/computer games	12.4
Depression	11.9
Concern for a friend/family member	11.0
Relationship difficulties	10.5
Extracurricular activities	9.5

Each of these issues is related to one or more of the seven dimensions of wellness, and most can be influenced by choices students make daily. Although some troubles—such as the death of a friend—cannot be controlled, other physical and emotional concerns can be minimized by choosing healthy behaviors. For example, there are many ways to manage stress, the top health issue affecting students. By reducing unhealthy choices (such as using alcohol to relax) and by increasing healthy choices (such as using time management techniques), even busy students can reduce the impact of stress on their lives.

The survey also estimated that, based on students' reporting of their height and weight, nearly 33% of college students are

either overweight or obese. Although heredity plays a role in determining one's weight, lifestyle is also a factor in weight and weight management.

In many studies over the past few decades, a large percentage of students have reported behaviors such as these:

- Overeating
- Snacking on junk food
- Frequently eating high-fat foods
- Using alcohol and binge drinking

Clearly, eating behaviors are often a matter of choice. Although students may not see (or feel) the effects of their dietary habits today, the long-term health risks are significant. Overweight and obese persons run a higher-than-normal risk of developing diabetes, heart disease, and cancer later in life. We now know with certainty that improving one's eating habits, even a little, can lead to weight loss and improved overall health.

Other Choices, Other Problems

Students commonly make other unhealthy choices. Here are some examples from the 2011 National College Health Assessment II:

- About 48% of students reported that they did not use a condom the last time they had vaginal intercourse.
- About 15% of students had seven or more drinks the last time they partied.
- About 15% of students had smoked cigarettes at least once during the past month.

What choices do you make in these situations? Remember: It's never too late to change. The sooner you trade an unhealthy behavior for a healthy one, the longer you'll be around to enjoy the benefits.

SOURCE: American College Health Association. 2011. *American College Health Association–National College Health Assessment II: Reference Group Executive Summary Spring 2011*. Hanover, MD: American College Health Association. Reprinted by permission of the American College Health Association.

Other habits, however, are beneficial. Regular exercise can help prevent heart disease, high blood pressure, diabetes, osteoporosis, and depression. Exercise can also reduce the risk of colon cancer, stroke, and back injury. A balanced and varied diet helps prevent many chronic diseases. As we learn more about how our actions affect our bodies and minds, we can make informed choices for a healthier life.

Heredity/Family History Your **genome** consists of the complete set of genetic material in your cells—about 25,000

genes, half from each of your parents. **Genes** control the production of proteins that serve both as the structural material for your body and as the regulators of all your body's

genome The complete set of genetic material in an individual's cells.

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gene The basic unit of heredity; a section of genetic material containing chemical instructions for making a particular protein.

EMBRACING WELLNESS

The Environmental Challenge



The effect of human activity on the environment has gradually become clear over several generations, and awareness has grown about environmental issues like air and water pollution, resource depletion, waste disposal, and overpopulation.

Only in the last few years, however, has climate change attracted intensive attention worldwide. Most scientists agree that human activity—specifically, the burning of fossil fuels for energy and the release of greenhouse gases into the atmosphere—has caused changes that are raising Earth's temperature and threatening the health of the planet and its living systems. The evidence includes melting ice caps, shifting weather patterns, species extinctions, and a gradual increase in worldwide temperatures. Scientists are trying to determine how high Earth's temperature can climb before a tipping point is reached when damage becomes irreversible.

As governments and industry only begin to address (and some continue to deny) the issue of climate change, you may wonder if it is possible for individuals to make a difference in improving our climate. The answer is yes. In fact, some believe we have moved past the time when we can depend on experts to solve environmental problems. Instead a broader understanding of environmental issues by the



general public is needed, along with the willingness to make different choices in everyday life. Of course government at every level must lead the way, but there are hundreds of actions each of us can take to reduce our impact on the environment. Here are just a few:

- **Drive less.** Walk, bike, and take public transportation more.
- **Use less energy.** Use less heat, hot water, and air conditioning, and turn off lights and electronic devices, including power strips and chargers, when not in use.
- **Buy energy-efficient products**—from cars to appliances to compact fluorescent lightbulbs.
- **Eat responsibly.** Buy locally grown foods to reduce the amount of fuel needed to transport food, as well as air pollution and greenhouse gas emissions. Eating organically keeps petroleum-based pesticides and chemicals out of the food chain and water supply.
- **Measure your personal carbon footprint** with an online calculator, and learn what you can do to reduce it.

Chapter 19 explores various aspects of environmental health and literacy and discusses environmental issues in detail. Achieving a balance between global development and environmental protection is the great challenge facing the 21st century and all world citizens.

chemical reactions and metabolic processes. The human genome varies only slightly from person to person, and many of these differences do not affect health. However, some differences have important implications for health, and knowing your family's health history can help you determine which conditions may be of special concern for you.

Errors in our genes are responsible for about 3500 clearly hereditary conditions, including sickle-cell disease and cystic fibrosis. Altered genes also play a part in heart disease, cancer, stroke, diabetes, and many other common conditions. However, in these more common and complex disorders, genetic alterations serve only to increase an individual's risk, and the disease itself results from the interaction of many genes with other factors. An example of the power of behavior and environment can be seen in the more than 60% increase in the incidence of diabetes that has occurred among Americans since 1990. This huge increase is not due to any sudden change in our genes; it is the result of increasing rates of obesity caused by poor dietary choices and lack of physical activity.

QUICK STATS

8% of Americans have diabetes, but about one-fourth of them don't know it.

—American Diabetes Association, 2012

Environment Your environment includes substances and conditions in your home, workplace, and community. Are you frequently exposed to environmental tobacco smoke or the radiation in sunlight? Do you live in an area with high rates of crime and violence? Do you have access to nature? Today environmental influences on wellness also include conditions in other countries and around the globe, particularly weather and climate changes occurring as a result of global warming (see the box titled “The Environmental Challenge”).

Access to Health Care Adequate health care helps improve both quality and quantity of life through preventive care and the treatment of disease. For example, vaccinations prevent many dangerous infections, and screening tests help identify key risk factors and diseases in their early treatable stages. As described earlier in the chapter, inadequate access to health care is tied to factors such as low income and lack of health insurance. Cost is

one of many issues surrounding the development of advanced health-related technologies.

Taking Personal Responsibility for Your Wellness

In many cases, behavior can tip the balance toward good health, even when heredity or environment is a negative factor. For example, breast cancer can run in families, but it also may be associated with being overweight and inactive. A woman with a family history of breast cancer is less likely to develop the disease if she controls her weight, exercises regularly, and has regular mammograms to help detect the disease in its early, most treatable stage.

Similarly, a young man with a family history of obesity can maintain a normal weight by being careful to balance calorie intake against activities that burn calories. If your life is highly stressful, you can lessen the chances of heart disease and stroke by learning ways to manage and cope with stress. If you live in an area with severe air pollution, you can reduce the risk of lung disease by not smoking. You can also take an active role in improving your environment. Behaviors like these enable you to make a difference in how great an impact heredity and environment will have on your health.

REACHING WELLNESS THROUGH LIFESTYLE MANAGEMENT

As you consider the behaviors that contribute to wellness—being physically active, choosing a healthful diet, and so on—you may be doing a mental comparison with your own behaviors. If you are like most young adults, you probably have some healthy habits and some habits that place your health at risk. For example, you may be physically active and have a healthful diet but indulge in binge drinking on weekends. You may be careful to wear your safety belt in your car but smoke cigarettes or use chewing tobacco. Moving in the direction of wellness means cultivating healthy behaviors and working to overcome unhealthy ones. This approach to lifestyle management is called **behavior change**.

As you may already know from experience, changing an unhealthy habit (such as giving up cigarettes) can be harder than it sounds. When you embark on a behavior change plan, it may seem like too much work at first. But as you make progress, you will gain confidence in your ability to take charge of your life. You will also experience the benefits of wellness—more energy, greater vitality, deeper feelings of appreciation and curiosity, and a higher quality of life.

The rest of this chapter outlines a general process for changing unhealthy behaviors that is backed by research and that has worked for many people. The following sections offer many specific strategies and tips for change.

Getting Serious about Your Health

Before you can start changing a wellness-related behavior, you have to know that the behavior is problematic and that you *can* change it. To make good decisions, you need information about relevant topics and issues, including what resources are available to help you change.

Examine Your Current Health Habits Have you considered how your current lifestyle is affecting your health today and how it will affect your health in the future? Do you know which of your current habits enhance your health and which detract from it? Begin your journey toward wellness with self-assessment: Think about your own behavior, talk with friends and family members about what they have noticed about your lifestyle and your health, and take the quiz in the box titled “Wellness: Evaluate Your Lifestyle.” Challenge any unrealistically optimistic attitudes or ideas you may hold—for example, “To protect my health, I don’t need to worry about quitting smoking until I’m 40 years old” or “Being overweight won’t put me at risk for diabetes.” Health risks are very real and can become significant while you’re young; health habits are important throughout life.

Many people start to consider changing a behavior when friends or family members express concern, when a landmark event occurs (such as turning 30), or when new information raises their awareness of risk. If you find yourself reevaluating some of your behaviors as you read this text, take advantage of the opportunity to make a change in a structured way.

Moving in the direction of wellness means cultivating healthy behaviors and overcoming unhealthy ones.

Choose a Target Behavior Changing any behavior can be demanding. This is why it’s a good idea to start small by choosing one behavior you want to change—called a **target behavior**—and working on it until you succeed. Your chances of success will be greater if your first goal is simple, such as resisting the urge to snack between classes. As you change one behavior, make your next goal a little more significant, and build on your success.

behavior change A lifestyle management process that involves cultivating healthy behaviors and working to overcome unhealthy ones.

target behavior An isolated behavior selected as the object for a behavior change program.

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Learn about Your Target Behavior Once you've chosen a target behavior, you need to learn its risks and benefits for you—both now and in the future. Ask these questions:

- How is your target behavior affecting your level of wellness today?
- What diseases or conditions does this behavior place you at risk for?
- What effect would changing your behavior have on your health?

As a starting point, use this text and the resources listed in the “For More Information” section at the end of each chapter. See the “Evaluating Sources of Health Information” box for additional guidelines.

Find Help Have you identified a particularly challenging target behavior or mood—something like alcohol addiction, binge eating, or depression—that interferes with your ability to function or places you at a serious health risk? If so, you may need help to change a behavior or condition that is too deeply rooted or too serious for self-management. Don't let the problem's seriousness stop you; many resources are available to help you solve it. On campus, the student health center or campus counseling center can provide assistance. To locate community resources, consult the yellow pages, your physician, or the Internet.

Building Motivation to Change

Knowledge is necessary for behavior change, but it isn't usually enough to make people act. Millions of people have sedentary lifestyles, for example, even though they know it's bad for their health. This is particularly true of young adults, who may not be motivated to change because they feel healthy despite their unhealthy behaviors. To succeed at behavior change, you need strong motivation. Here are some ways to boost your motivation.

Examine the Pros and Cons of Change Health behaviors have short-term and long-term benefits and costs. Consider the benefits and costs of an inactive lifestyle:

- Short-term, such a lifestyle allows you more time to watch TV, use social media, do your homework, and hang out with friends, but it leaves you less physically fit and less able to participate in recreational activities.
- Long-term, it increases the risk of heart disease, cancer, stroke, and premature death.

To successfully change your behavior, you must believe that the benefits of change outweigh the costs.

Carefully examine the pros and cons of continuing your current behavior and of changing to a healthier one. Focus on

the effects that are most meaningful to you, including those that are tied to your personal identity and values. For example, if you see yourself as an active person who is a good role model for others, then adopting behaviors such as engaging in regular physical activity and getting adequate sleep will support your personal identity. If you value independence and control over your life, then quitting smoking will be consistent with your values and goals. To complete your analysis, ask friends and family members about the effects of your behavior on them. For example, a younger sister may say that your smoking habit influenced her decision to start smoking.

The short-term benefits of behavior change can be an important motivating force. Although some people are motivated by long-term goals, such as avoiding a disease that may hit them in 30 years, most are more likely to be moved to action by shorter-term, more personal goals. Feeling better, doing better in school, improving at a sport, reducing stress, and increasing self-esteem are common short-term benefits of health behavior change. Many wellness behaviors are associated with immediate improvements in quality of life. For example, surveys of Americans have found that non-smokers feel healthy and full of energy more days each month than do smokers, and they report fewer days of sadness and troubled sleep; the same is true when physically active people are compared with sedentary people. Over time, these types of differences add up to a substantially higher quality of life for people who engage in healthy behaviors.

Boost Self-Efficacy When you start thinking about changing a health behavior, a big factor in your eventual success is whether you have confidence in yourself and in your ability to change. **Self-efficacy** refers to your belief in your ability to successfully take action and perform a specific task. Strategies for boosting self-efficacy include developing an internal locus of control, using visualization and self-talk, and getting encouragement from supportive people.

LOCUS OF CONTROL Who do you believe is controlling your life? Is it your parents, friends, or school? Is it “fate”? Or is it you? **Locus of control** refers to the figurative “place” a person designates as the source of responsibility for the events in his or her life. People who believe they are in control of their own lives are said to have an *internal locus of control*. Those who believe that factors beyond their control determine the course of their lives are said to have an *external locus of control*.

self-efficacy The belief in one's ability to take action and perform a specific task.

locus of control The figurative “place” a person designates as the source of responsibility for the events in his or her life.

TERMS



ASSESS YOURSELF

Wellness: Evaluate Your Lifestyle

All of us want optimal health. But many of us do not know how to achieve it. Taking this quiz, adapted from one created by the U.S. Public Health Service, is a good place to start. The behaviors covered in the quiz are recommended for most Americans. (Some of them may not apply to people with certain diseases or disabilities or to pregnant women, who may require special advice from their physician.) After you take the quiz, add up your score for each section.

Tobacco Use

If you never use tobacco, enter a score of 10 for this section and go to the next section.

	ALMOST ALWAYS	SOMETIMES	NEVER
1. I avoid smoking tobacco.	2	1	0
2. I avoid using a pipe or cigars.	2	1	0
3. I avoid spit tobacco.	2	1	0
4. I limit my exposure to environmental tobacco smoke.	2	1	0

Tobacco score: _____

Alcohol and Other Drugs

1. I avoid alcohol <i>or</i> I drink no more than one (women) <i>or</i> two (men) drinks a day.	4	1	0
2. I avoid using alcohol or other drugs as a way of handling stressful situations or problems in my life.	2	1	0
3. I am careful not to drink alcohol when taking medications, such as for colds or allergies, or when pregnant.	2	1	0
4. I read and follow the label directions when using prescribed and over-the-counter drugs.	2	1	0

Alcohol and other drugs score: _____

Nutrition

1. I eat a variety of foods each day, including seven or more servings of fruits and vegetables.	3	1	0
2. I limit the amount of total fat and saturated and trans fat in my diet.	3	1	0
3. I avoid skipping meals.	2	1	0
4. I limit the amount of salt and added sugar I eat.	2	1	0

Nutrition score: _____

Exercise/Fitness

1. I engage in moderate exercise for 20–60 minutes, 3–5 times a week.	4	1	0
2. I maintain a healthy weight, avoiding overweight and underweight.	2	1	0
3. I exercise to develop muscular strength and endurance at least twice a week.	2	1	0
4. I spend some of my leisure time participating in physical activities such as gardening, bowling, golf, or baseball.	2	1	0

Exercise/fitness score: _____

Emotional Health

1. I enjoy being a student, and I have a job or do other work that I like.	2	1	0
2. I find it easy to relax and express my feelings freely.	2	1	0
3. I manage stress well.	2	1	0
4. I get along well with other people.	2	1	0
5. I participate in group activities (such as church and community organizations) or hobbies that I enjoy.	2	1	0

Emotional health score: _____

Support

- | | | | |
|--|---|---|---|
| 1. I volunteer one or more times each year. | 2 | 1 | 0 |
| 2. I enjoy helping other people. | 2 | 1 | 0 |
| 3. I feel free to ask others for help. | 2 | 1 | 0 |
| 4. I have close friends with whom I can talk about personal matters. | 2 | 1 | 0 |
| 5. I acknowledge the success and achievements of others. | 2 | 1 | 0 |

Support score: _____

Safety

- | | | | |
|--|---|---|---|
| 1. I wear a safety belt while riding in a car. | 2 | 1 | 0 |
| 2. I avoid driving while under the influence of alcohol or other drugs. | 2 | 1 | 0 |
| 3. I obey traffic rules and speed limits when driving. | 2 | 1 | 0 |
| 4. I read and follow instructions on the labels of potentially harmful products or substances, such as household cleaners, poisons, and electrical appliances. | 2 | 1 | 0 |
| 5. I avoid using a cell phone while driving. | 2 | 1 | 0 |

Safety score: _____

Disease Prevention

- | | | | |
|---|---|---|---|
| 1. I know the warning signs of cancer, diabetes, heart attack, and stroke. | 2 | 1 | 0 |
| 2. I avoid overexposure to the sun and use sunscreen. | 2 | 1 | 0 |
| 3. I get recommended medical screening tests (such as blood pressure checks and Pap tests), immunizations, and booster shots. | 2 | 1 | 0 |
| 4. I perform monthly breast/testicle self-exams. | 2 | 1 | 0 |
| 5. I am not sexually active <i>or</i> I have sex with only one mutually faithful, uninfected partner <i>or</i> I always engage in safe sex (using condoms) <i>and</i> I do not share needles to inject drugs. | 2 | 1 | 0 |

Disease prevention score: _____

What Your Scores Mean

Scores of 9 and 10 Excellent! Your answers show that you are aware of the importance of this area to your health. More important, you are putting your knowledge to work for you by practicing good health habits. As long as you continue to do so, this area should not pose a serious health risk.

Scores of 6 to 8 Your health practices in this area are good, but there is room for improvement.

Scores of 3 to 5 Your health risks are showing.

Scores of 0 to 2 You may be taking serious and unnecessary risks with your health.



CRITICAL CONSUMER

Evaluating Sources of Health Information

Believability of Health Information Sources

Surveys indicate that college students are smart about evaluating health information. They trust the health information they receive from health professionals and educators and are skeptical about popular information sources, such as magazine articles and websites.

How good are you at evaluating health information? Here are some tips.

General Strategies

Whenever you encounter health-related information, take the following steps to make sure it is credible:

- **Go to the original source.** Media reports often simplify the results of medical research. Find out for yourself what a study really reported, and determine whether it was based on good science. What type of study was it? Was it published in a recognized medical journal? Was it an animal study or did it involve people? Did the study include a large number of people? What did the authors of the study actually report?
- **Watch for misleading language.** Reports that tout “breakthroughs” or “dramatic proof” are probably hype. A study may state that a behavior “contributes to” or is “associated with” an outcome; this does not prove a cause-and-effect relationship.
- **Distinguish between research reports and public health advice.** Do not change your behavior based on the results of a single report or study. If an agency such as the National Cancer Institute urges a behavior change, however, you should follow its advice. Large, publicly funded organizations issue such advice based on many studies, not a single report.
- **Remember that anecdotes are not facts.** A friend may tell you he lost weight on some new diet, but individual success stories do not mean the plan is truly safe or effective. Check with your doctor before making any serious lifestyle changes.

- **Be skeptical.** If a report seems too good to be true, it probably is. Be wary of information contained in advertisements. An ad’s goal is to sell a product, even if there is no need for it.

- **Make choices that are right for you.** Friends and family members can be a great source of ideas and inspiration, but you need to make health-related choices that work best for you.

Internet Resources

Online sources pose special challenges; when reviewing a health-related website, ask these questions:

- **What is the source of the information?** Websites maintained by government agencies, professional associations, or established academic or medical institutions are likely to present trustworthy information. Many other groups and individuals post accurate information, but it is important to look at the qualifications of the people who are behind the site. (Check the home page or click the “About Us” link.)
- **How often is the site updated?** Look for sites that are updated frequently. Check the “last modified” date of any web page.
- **Is the site promotional?** Be wary of information from sites that sell specific products, use testimonials as evidence, appear to have a social or political agenda, or ask for money.
- **What do other sources say about a topic?** Be cautious of claims or information that appear at only one site or come from a chat room, bulletin board, newsgroup, or blog.
- **Does the site conform to any set of guidelines or criteria for quality and accuracy?** Look for sites that identify themselves as conforming to some code or set of principles, such as those established by the Health on the Net Foundation or the American Medical Association. These codes include criteria such as use of information from respected sources and disclosure of the site’s sponsors.

For lifestyle management, an internal locus of control is an advantage because it reinforces motivation and commitment. An external locus of control can sabotage efforts to change behavior. For example, if you believe that you are destined to die of breast cancer because your mother died from the disease, you may view monthly breast self-exams and regular checkups as a waste of time. In contrast, if you believe that you can take action to reduce your risk of breast can-

QUICK STATS

49.5 million
living American
adults have
stopped smoking.

—American Cancer Society, 2012

cer despite hereditary factors, you will be motivated to follow guidelines for early detection of the disease.

If you find yourself attributing too much influence to outside forces, gather more information about your wellness-related behaviors. List all the ways that making lifestyle changes will improve your health. If you believe you’ll succeed, and if you recognize that you are in charge of your life, you’re on your way to wellness.

TAKE CHARGE

Tips for Moving Forward in the Cycle of Behavior Change



Precontemplation

- **Raise your awareness.** Research your target behavior and its effects.
- **Be self-aware.** Look at the mechanisms you use to resist change, such as denial or rationalization. Find ways to counteract these mechanisms.
- **Seek social support.** Friends and family members can help you identify target behaviors and understand their impact on the people around you.
- **Identify helpful resources.** These might include exercise classes or stress management workshops offered by your school.

Contemplation

- **Keep a journal.** A record of your target behavior and the circumstances that elicit the behavior can help you plan a change program.
- **Do a cost-benefit analysis.** Identify the costs and benefits (both current and future) of maintaining your behavior and of changing it. Costs can be monetary, social, emotional, and so on.
- **Identify barriers to change.** Knowing these obstacles can help you overcome them.
- **Engage your emotions.** Watch movies or read books about people with your target behavior. Imagine what your life will be like if you don't change.
- **Create a new self-image.** Imagine what you'll be like after changing your target behavior. Try to think of yourself in those new terms right now.
- **Think before you act.** Learn why you engage in the target behavior. Determine what "sets you off," and train yourself not to act reflexively.

Preparation

- **Create a plan.** Include a start date, goals, rewards, and specific steps you will take to change your behavior.

- **Make change a priority.** Create and sign a contract with yourself.

- **Practice visualization and self-talk.** These techniques can help prepare you mentally for challenging situations.

- **Take short steps.** Successfully practicing your new behavior for a short time—even a single day—can boost your confidence and motivation.

Action

- **Monitor your progress.** Keep up with your journal entries.
- **Change your environment.** Make changes that will discourage the target behavior—for example, getting rid of snack foods or not stocking the refrigerator with beer.
- **Find alternatives to your target behavior.** Make a list of things you can do to replace the behavior.
- **Reward yourself.** Rewards should be identified in your change plan. Give yourself lots of praise, and focus on your success.
- **Involve your friends.** Tell them you want to change, and ask for their help.
- **Don't get discouraged.** Real change is difficult.

Maintenance

- **Keep going.** Continue using the positive strategies that worked in earlier stages.
- **Be prepared for lapses.** Don't let slip-ups set you back.
- **Be a role model.** Once you successfully change your behavior, you may be able to help someone do the same thing.

VISUALIZATION AND SELF-TALK One of the best ways to boost your confidence and self-efficacy is to visualize yourself successfully engaging in a new, healthier behavior. Imagine yourself going for an afternoon run three days a week or no longer smoking cigarettes. Also visualize yourself enjoying all the short-term and long-term benefits that your lifestyle change will bring. Create a new self-image: What will you and your life be like when you become a regular exerciser or a nonsmoker?

You can also use *self-talk*, the internal dialogue you carry on with yourself, to increase your confidence in your ability to change. Counter any self-defeating patterns of thought with more positive or realistic thoughts: "I am a strong, ca-

pable person, and I can maintain my commitment to change." (See Chapter 3 for more about self-talk.)

ROLE MODELS AND SUPPORTIVE PEOPLE Social support can make a big difference in your level of motivation and your chances of success. Perhaps you know people who have reached the goal you are striving for. They could be role models or mentors for you, providing information and support for your efforts. Gain strength from their experiences, and tell yourself, "If they can do it, so can I." Find a buddy who wants to make the same changes you do and who can take an active role in your behavior change program. For example, an exercise buddy can provide companionship and

connect
ACTIVITY
DO IT ONLINE

encouragement when you might be tempted to skip your workout.

IDENTIFY AND OVERCOME BARRIERS TO CHANGE Don't let past failures at behavior change discourage you. They can be a great source of information you can use to boost your chances of future success. Make a list of the problems and challenges you faced in any previous behavior change attempts. To this, add the short-term costs of behavior change that you identified in your analysis of the pros and cons of change. Once you've listed these key barriers to change, develop a practical plan for overcoming each one. For example, if you always smoke when you're with certain friends, decide in advance how you will turn down the next cigarette you are offered.

Enhancing Your Readiness to Change

The transtheoretical, or “stages of change,” model has been shown to be an effective approach to lifestyle self-management. According to this model, you move through distinct stages as you work to change your target behavior. It is important to determine what stage you are in now so that you can choose appropriate strategies for progressing through the cycle of change. This approach can help you enhance your readiness and intention to change. Read the following sections to determine what stage you are in for your target behavior. For ideas on changing stages, see the “Tips for Moving Forward in the Cycle of Behavior Change” box.

Precontemplation People at this stage do not think they have a problem and do not intend to change their behavior. They may be unaware of the risks associated with their behavior or may deny them. They may have tried unsuccessfully to change in the past and may now think the situation is hopeless. They may also blame other people or external factors for their problems. People in the precontemplation stage believe that there are more reasons or more important reasons not to change than there are reasons to change.

Contemplation People at this stage know they have a problem and intend to take action within six months. They acknowledge the benefits of behavior change but are also aware of the costs of changing. To be successful, people must believe that the benefits of change outweigh the costs. People in the contemplation stage wonder about possible courses of action but don't know how to proceed. There may also be specific barriers to change that appear too difficult to overcome.

Preparation People at this stage plan to take action within a month or may already have begun to make small changes in their behavior. They may be engaging in their new, healthier behavior but not yet regularly or consistently. They may have created a plan for change but may be worried about failing.

Action During the action stage, people outwardly modify their behavior and their environment. The action stage requires the greatest commitment of time and energy, and people

in this stage are at risk for relapsing into old, unhealthy patterns of behavior.

Maintenance People at this stage have maintained their new, healthier lifestyle for at least six months. Lapses may have occurred, but people in maintenance have been successful in quickly reestablishing the desired behavior. The maintenance stage can last months or years.

Termination For some behaviors, a person may reach the sixth and final stage of termination. People at this stage have exited the cycle of change and are no longer tempted to lapse back into their old behavior. They have a new self-image and total self-efficacy with regard to their target behavior.

Dealing with Relapse

People seldom progress through the stages of change in a straightforward, linear way. Rather, they tend to move to a certain stage and then slip back to a previous stage before resuming their forward progress. Research suggests that most people make several attempts before they successfully change a behavior, and four out of five people experience some degree of backsliding. For this reason, the stages of change are best conceptualized as a spiral in which people cycle back through previous stages but are farther along in the process each time they renew their commitment (Figure 1.5).

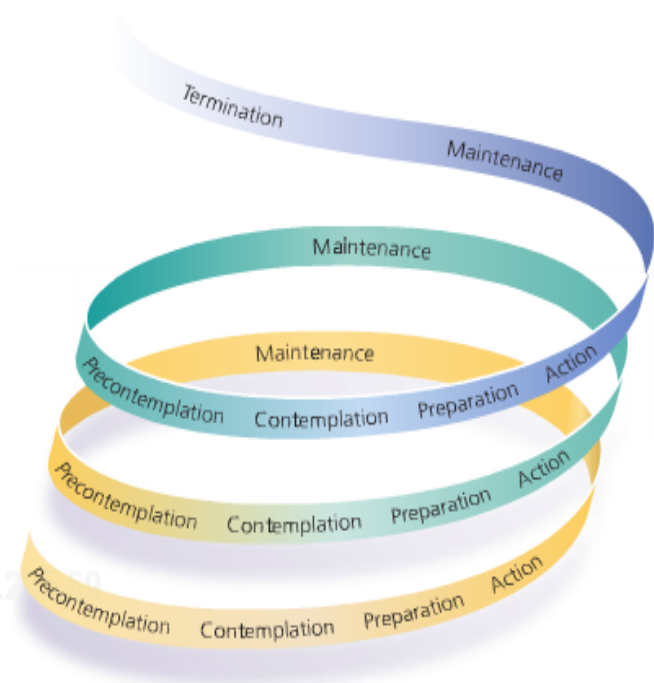


FIGURE 1.5 The stages of change: A spiral model.

SOURCE: Adapted from Prochaska, J. O., C. C. DiClemente, and J. C. Norcross. 1992. In search of how people change. *American Psychologist* 47(9): 1102–1114. Copyright © by the American Psychological Association. Reprinted by permission.

If you experience a lapse (a single slip) or a relapse (a return to old habits), don't give up. Relapse can be demoralizing, but it is not the same as failure; failure means stopping before you reach your goal and never changing your target behavior. During the early stages of the change process, it's a good idea to plan for relapse so you can avoid guilt and self-blame and get back on track quickly. Follow these steps:

1. **Forgive yourself.** A single setback isn't the end of the world, but abandoning your efforts to change could have negative effects on your life.
2. **Give yourself credit for the progress you have already made.** You can use that success as motivation to continue.
3. **Move on.** You can learn from a relapse and use that knowledge to deal with potential future setbacks.

If relapses keep occurring or you can't seem to control them, you may need to return to a previous stage of the behavior change process. If this is necessary, reevaluate your goals and strategy. A different or less stressful approach may help you avoid setbacks when you try again.

Developing Skills for Change: Creating a Personalized Plan

Once you are committed to making a change, it's time to put together a plan of action. Your key to success is a well-thought-out plan that sets goals, anticipates problems, and includes rewards.

1. Monitor Your Behavior and Gather Data Keep a record of your target behavior and the circumstances surrounding it. Record this information for at least a week or two. Keep your notes in a health journal or notebook or on

your computer (see the sample journal entries in Figure 1.6). Record each occurrence of your behavior, noting the following:

- What the activity was.
- When and where it happened.
- What you were doing.
- How you felt at that time.

If your goal is to start an exercise program, track your activities to determine how to make time for workouts.

2. Analyze the Data and Identify Patterns After you have collected data on the behavior, analyze the data to identify patterns. When are you most likely to overeat? What events trigger your appetite? Perhaps you are especially hungry at midmorning or when you put off eating dinner until 9:00. Perhaps you overindulge in food and drink when you go to a particular restaurant or when you're with certain friends. Note the connections between your feelings and such external cues as time of day, location, situation, and the actions of others around you.

3. Be "SMART" about Setting Goals If your goals are too challenging, you will have trouble making steady progress and will be more likely to give up altogether. If, for example, you are in poor physical condition, it will not make sense to set a goal of being ready to run a marathon within two months. If you set goals you can live with, it will be easier to stick with your behavior change plan and be successful.

Experts suggest that your goals meet the "SMART" criteria; that is, your behavior change goals should be

- **Specific.** Avoid vague goals like "eat more fruits and vegetables." Instead state your objectives in specific terms,

Date		November 5		Day								M	TU	W	TH	F	SA	SU
Time of day	M/S	Food eaten	Cals.	H	Where did you eat?	What else were you doing?	How did someone else influence you?	What made you want to eat what you did?	Emotions and feelings?	Thoughts and concerns?								
7:30	M	1 C Crispix cereal 1/2 C skim milk coffee, black 1 C orange juice	110 40 — 120	3	home	reading newspaper	alone	I always eat cereal in the morning	a little keyed up & worried	thinking about quiz in class today								
10:30	S	1 apple	90	1	hall outside classroom	studying	alone	felt tired & wanted to wake up	tired	worried about next class								
12:30	M	1 C chili 1 roll 1 pat butter 1 orange 2 oatmeal cookies 1 soda	290 120 35 60 120 150	2	campus food court	talking	eating w/ friends; we decided to eat at the food court	wanted to be part of group	excited and happy	interested in hearing everyone's plans for the weekend								
M/S = Meal or snack											H = Hunger rating (0–3)							

FIGURE 1.6 Sample health journal entries.

such as “eat two cups of fruit and three cups of vegetables every day.”

- **Measurable.** Recognize that your progress will be easier to track if your goals are quantifiable, so give your goal a number. You might measure your goal in terms of time (such as “walk briskly for 20 minutes a day”), distance (“run two miles, three days per week”), or some other amount (“drink eight glasses of water every day”).
- **Attainable.** Set goals that are within your physical limits. For example, if you are a poor swimmer, it might not be possible for you to meet a short-term fitness goal by swimming laps. Walking or biking might be better options.
- **Realistic.** Manage your expectations when you set goals. For example, it may not be possible for a long-time smoker to quit cold turkey. A more realistic approach might be to use nicotine replacement patches or gum for several weeks while getting help from a support group.
- **Time frame–specific.** Give yourself a reasonable amount of time to reach your goal, state the time frame in your behavior change plan, and set your agenda to meet the goal within the given time frame.

Using these criteria, a sedentary person who wants to improve his health and build fitness might set a goal of being able to run three miles in 30 minutes, to be achieved within a time frame of six months. To work toward that goal, he might set a number of smaller, intermediate goals that are easier to achieve. For example, his list of goals might look like this:

WEEK	FREQUENCY (DAYS/WEEK)	ACTIVITY	DURATION (MINUTES)
1	3	Walk < 1 mile	10–15
2	3	Walk 1 mile	15–20
3	4	Walk 1–2 miles	20–25
4	4	Walk 2–3 miles	25–30
5–7	3–4	Walk/run 1 mile	15–20
⋮			
21–24	4–5	Run 2–3 miles	25–30

Of course it may not be possible to meet these goals, but you never know until you try. As you work toward meeting your long-term goal, you may find it necessary to adjust your short-term goals. For example, you may find that you can start running sooner than you thought, or you may be able to run farther than you originally estimated. In such cases, it may be reasonable to make your goals more challenging. In contrast, if your goals are too difficult, you may want to make them easier in order to stay motivated.

Your behavior change goals should be specific, measurable, attainable, realistic, and time frame–specific.

For some goals and situations, it may make more sense to focus on something other than your outcome goal. If you are in an early stage of change, for example, your goal may be to learn more about the risks associated with your target behavior or to complete a cost-benefit analysis. If your goal involves a long-term lifestyle change, such as reaching a healthy weight, it is better to focus on developing healthy habits than to target a specific weight loss. Your goal in this case might be exercising for 30 minutes every day, reducing portion sizes, or eliminating late-night snacks.

4. Devise a Plan of Action Develop a strategy that will support your efforts to change. Your plan of action should include the following steps:

- **Get what you need.** Identify resources that can help you. For example, you can join a community walking club or sign up for a smoking cessation program. You may also need to buy some new running shoes or nicotine replacement patches. Get the items you need right away; waiting can delay your progress.
- **Modify your environment.** If there are cues in your environment that trigger your target behavior, try to control them. For example, if you normally have alcohol at home, getting rid of it can help prevent you from indulging. If you usually study with a group of friends in an environment that allows smoking, try moving to a nonsmoking area. If you always buy a snack at a certain vending machine, change your route so you don’t pass by it.
- **Control related habits.** You may have habits that contribute to your target behavior. Modifying these habits can help change the behavior. For example, if you usually plop down on the sofa while watching TV, try putting an exercise bike in front of the set so you can burn calories while watching your favorite programs.
- **Reward yourself.** Giving yourself instant, real rewards for good behavior will reinforce your efforts. Plan your rewards; decide in advance what each one will be and how you will earn it. Tie rewards to achieving specific goals or sub-goals. For example, you might treat yourself to a movie after a week of avoiding snacks. Make a list of items or events to use

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think about the last time you made an unhealthy choice instead of a healthy one. How could you have changed the situation, the people in the situation, or your own thoughts, feelings, or intentions to avoid making that choice? What can you do in similar situations in the future to produce a different outcome?



Your environment contains powerful cues for both positive and negative lifestyle choices. Identifying and using the healthier options available to you throughout the day is a key part of a successful behavior change program.

as rewards. They should be special to you and preferably unrelated to food or alcohol.

- **Involve the people around you.** Tell family and friends about your plan, and ask them to help. To help them respond appropriately to your needs, create a specific list of dos and don'ts. For example, ask them to support you when you set aside time to exercise or avoid second helpings at dinner.

- **Plan for challenges.** Think about situations and people that might derail your program, and develop ways to cope with them. For example, if you think it will be hard to stick to your usual exercise program during exams, schedule short bouts of physical activity (such as a brisk walk) as stress-reducing study breaks.

5. Make a Personal Contract A serious personal contract—one that commits you to your word—can result in a better chance of follow-through than a casual, offhand promise. Your contract can help prevent procrastination by specifying important dates and can also serve as a reminder of your personal commitment to change.

Your contract should include a statement of your goal and your commitment to reaching it. The contract should also include details, such as the following:

- The date you will start
- The steps you will take to measure your progress
- The strategies you plan to use to promote change
- The date you expect to reach your final goal

Have someone—preferably someone who will be actively helping you with your program—sign your contract as a witness.

Figure 1.7 shows a sample behavior change contract for someone who is committing to eating more fruit every day.

You can apply the general behavior change planning framework presented in this chapter to any target behavior.

Behavior Change Contract

- 1 I, Tammy Lau, agree to increase my consumption of fruit from 1 cup per week to 2 cups per day.
- 2 I will begin on 10/5 and plan to reach my goal of 2 cups of fruit per day by 12/7.
- 3 To reach my final goal, I have devised the following schedule of mini-goals. For each step in my program, I will give myself the reward listed.

I will begin to have $\frac{1}{2}$ cup of fruit with breakfast	<u>10/5</u>	<u>see movie</u>
I will begin to have $\frac{1}{2}$ cup of fruit with lunch	<u>10/26</u>	<u>new cd</u>
I will begin to substitute fruit juice for soda 1 time per day	<u>11/16</u>	<u>concert</u>

 My overall reward for reaching my goal will be trip to beach.
- 4 I have gathered and analyzed data on my target behavior and have identified the following strategies for changing my behavior: Keep the fridge stocked with easy-to-carry fruit. Pack fruit in my backpack every day. Buy lunch at place that serves fruit.
- 5 I will use the following tools to monitor my progress toward my final goal: Chart on fridge door
Health journal
I sign this contract as an indication of my personal commitment to reach my goal: Tammy Lau 9/28
I have recruited a helper who will witness my contract and also increase his consumption of fruit; eat lunch with me twice a week.
Eric March 9/28

FIGURE 1.7 A sample behavior change contract.

Additional examples of behavior change plans appear in the Behavior Change Strategy sections at the end of many chapters in this text. In these sections, you will find specific plans for quitting smoking, starting an exercise program, and making other positive lifestyle changes.

Putting Your Plan into Action

When you're ready to put your plan into action, you need commitment—the resolve to stick with the plan no matter what temptations you encounter. Remember all the reasons you have to make the change—and remember that *you* are the boss. Use all your strategies to make your plan work. Make sure your environment is change-friendly, and get as much support and encouragement from others as possible. Keep track of your progress in your health journal, and give yourself regular rewards. And don't forget to give yourself a pat on the back—congratulate yourself, notice how much better you look or feel, and feel good about how far you've come and how you've gained control of your behavior.

Staying with It

As you continue with your program, don't be surprised when you run up against obstacles; they're inevitable. In fact, it's a good idea to expect problems and give yourself time to step

back, see how you're doing, regroup, and make some changes before going on. If your program is grinding to a halt, identify what is blocking your progress. It may come from one of the sources described in the following sections.

Social Influences Take a hard look at the reactions of the people you're counting on, and see if they're really supporting you. If they come up short, connect with others who will be more supportive. Finding a dedicated workout partner, for example, can renew your desire to work toward your goal.

A related trap is trying to get your friends or family members to change *their* behaviors. The decision to make a major behavior change is something people come to only after intensive self-examination. The fact that you have seen a light doesn't mean that anyone else has. You may be able to influence someone by tactfully providing facts or support, but you cannot demand more. Focus on yourself. When you succeed, you may become a role model for others.

Levels of Motivation and Commitment You won't make real progress until an inner drive leads you to the stage of change at which you are ready to make a personal commitment to the goal. If commitment is your problem, you may need to wait until the behavior you're dealing with makes you unhappier or unhealthier; then your desire to change it will be stronger. Or you may find that changing your goal will inspire you to keep going.

Choice of Techniques and Level of Effort If your plan is not working as well as you thought it would, make changes where you're having the most trouble. If you've lagged on your running schedule, for example, maybe it's because you don't like running. An aerobics class might suit you better. There are many ways to move toward your goal. Or you may not be trying hard enough. Regardless, it's important to push toward your goal. If it were easy, you wouldn't need a plan.

Stress If you hit a wall in your program, look at the sources of stress in your life. If the stress is temporary, such as catching a cold or having a term paper due, you may want to wait until it passes before strengthening your efforts. If the stress is ongoing, find healthy ways to manage it (see Chapter 2).

You may even want to make stress management your highest priority for behavior change.

Procrastinating, Rationalizing, and Blaming Be alert to games you might be playing with yourself, so you can stop them. Such games include the following:

- **Procrastinating.** If you tell yourself, "It's Friday already; I might as well wait until Monday to start," you're procrastinating. Break your plan into smaller steps that you can accomplish one day at a time. Figure out how to enjoy the activity, whether that involves doing it with music, going outdoors, adding meditation to your program, or visualizing the desired end result.
- **Rationalizing.** If you tell yourself, "I wanted to go swimming today but wouldn't have had time to wash my hair afterward," you're making excuses. When you "win" by deceiving yourself, it isn't much of a victory.
- **Blaming.** If you tell yourself, "I couldn't exercise because Dave was hogging the elliptical trainer," you're blaming others for your own failure to follow through. Blaming is a way of taking your focus off the real problem and denying responsibility for your own actions.

BEING HEALTHY FOR LIFE

Your first few behavior change projects may never go beyond the planning stage. Those that do may not all succeed. But as you begin to see progress and changes, you'll start to experience new and surprising positive feelings about yourself. You'll probably find that you're less likely to buckle under stress. You may accomplish things you never thought possible—winning a race, climbing a mountain, quitting smoking. Being healthy takes extra effort, but the paybacks in energy and vitality are priceless.

Once you've started, don't stop. Remember that maintaining good health is an ongoing process. Tackle one area at a time, but make a careful inventory of your health strengths and weaknesses and lay out a long-range plan. Take on the easier problems first, and then use what you have learned to attack more difficult areas. Keep informed about the latest health news and trends; research is constantly providing new information that directly affects daily choices and habits.

Making Changes in Your World

You can't completely control every aspect of your health. At least three other factors—heredity, health care, and environment—play important roles in your well-being. After you quit smoking, for example, you may still be inhaling smoke from other people's cigarettes. Your resolve to eat better foods may suffer a setback when you have trouble finding healthy choices on campus.

But you can make a difference—you can help create an environment around you that supports wellness for everyone. You can support nonsmoking areas in public places. You can speak

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you tried to change a behavior in the past, such as exercising more or quitting smoking? How successful were you? Do you feel the need to try again? If so, what would you do differently to improve your chances of success?

Connect to Your Choices

Have you ever thought about why you make the lifestyle choices you do? Many factors can influence our lifestyle choices, some not as obvious as others. Do you have a lot of the same lifestyle behaviors you had in high school, when you were living at home, such as watching TV or playing video games? Are you strongly influenced by your peers or roommates when it comes to eating and exercise patterns? Do you drink or smoke just because you have the freedom to do so?

What are the external factors that influence your choices about your lifestyle behaviors? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

up in favor of more nutritious foods and better physical fitness facilities. You can provide nonalcoholic drinks at your parties.

You can also work on larger environmental challenges: air and water pollution, traffic congestion, overcrowding and overpopulation, global warming and climate change, toxic and nuclear waste, and many others. These difficult issues need the

TIPS FOR TODAY AND THE FUTURE

You are in charge of your health. Many of the decisions you make every day have an impact on the quality of your life, both now and in the future. By making positive choices, large and small, you help ensure a lifetime of wellness.

RIGHT NOW YOU CAN:

- Go for a 15-minute walk.
- Have a piece of fruit for a snack.
- Call a friend and arrange a time to catch up with each other.
- Start thinking about whether you have a health behavior you'd like to change. If you do, consider the elements of a behavior change strategy. For example, begin a mental list of the pros and cons of the behavior, or talk to someone who can support you in your attempts to change.

IN THE FUTURE YOU CAN:

- Stay current on health- and wellness-related news and issues.
- Participate in health awareness and promotion campaigns in your community—for example, support smoking restrictions at local venues.
- Be a role model for (or at least be supportive to) someone else who is working on a health behavior you have successfully changed.

attention and energy of people who are informed and who care about good health. On every level, from personal to planetary, we can all take an active role in shaping our environment.

SUMMARY

- Wellness is the ability to live life fully, with vitality and meaning. Wellness is dynamic and multidimensional. It incorporates physical, emotional, intellectual, spiritual, interpersonal, environmental, and financial dimensions.
- As chronic diseases have become the leading cause of death in the United States, people have recognized that they have greater control over, and greater responsibility for, their health than ever before.
- The Healthy People initiative seeks to achieve a better quality of life for all Americans. The program's broad goals are to eliminate preventable disease, disabilities, injury, and premature death; achieve health equity for all groups; create social and physical environments that promote good health for all; and promote healthy development and healthy behaviors across every stage of life.
- Health-related differences among people that have implications for wellness can be described in the context of gender, ethnicity, income and education, disability, geographic location, and sexual orientation.
- Although heredity, environment, and health care all play roles in wellness and disease, behavior can mitigate their effects.
- To make lifestyle changes, you need information about yourself, your health habits, and resources available to help you change.
- You can increase your motivation for behavior change by examining the benefits and costs of change, boosting self-efficacy, and identifying and overcoming key barriers to change.
- The "stages of change" model describes six stages that people move through as they try to change their behavior: precontemplation, contemplation, preparation, action, maintenance, and termination.
- You can develop a specific plan for change by (1) monitoring behavior by keeping a journal; (2) analyzing those data; (3) setting specific goals; (4) devising strategies for modifying the environment, rewarding yourself, and involving others; and (5) making a personal contract.
- To start and maintain a behavior change program you need commitment, a well-developed plan, social support, and a system of rewards.
- Although we cannot control every aspect of our health, we can make a difference in helping create an environment that supports wellness for everyone.

FOR MORE INFORMATION

BOOKS

Duhigg, C. 2012. *The Power of Habit: Why We Do What We Do in Life and Business*. New York: Random House. An entertaining and intelligent exploration of how habits control our lives and how we can take charge of our habits to change our lives; includes both current research and a wealth of real-life stories.

Komaroff, A. L., ed. 2005. *Harvard Medical School Family Health Guide*. New York: Free Press. Provides consumer-oriented advice for the prevention and treatment of common health concerns.

Litin, S. C. (ed.). 2009. *Mayo Clinic Family Health Book*, 4th ed. New York: HarperCollins Publishers. A complete health reference for every stage of life, covering thousands of conditions, symptoms, and treatments.

Murat, B., and G. Stewart. 2009. *Do I Need to See the Doctor? The Home-Treatment Encyclopedia—Written by Medical Doctors—That Lets You Decide*, 2nd ed. New York: John Wiley & Sons. Fully illustrated, easy-to-read guide to hundreds of common symptoms and ailments, designed to help consumers determine whether they can treat themselves or should seek professional medical attention.

Prochaska, J. O., J. C. Norcross, and C. C. DiClemente. 1995. *Changing for Good: The Revolutionary Program That Explains the Six Stages of Change and Teaches You How to Free Yourself from Bad Habits*. New York: Morrow. Outlines the authors' model of behavior change and offers suggestions and advice for each stage of change.

NEWSLETTERS

Consumer Reports on Health (800-274-7596;
<http://www.consumerreports.org/health/home.htm>)

Harvard Health Publications (877-649-9457;
<http://www.health.harvard.edu>)

Mayo Clinic Health Letter (800-333-9037;
<http://healthletter.mayoclinic.com>)

University of California, Berkeley, Wellness Letter (800-829-9170;
<http://www.wellnessletter.com>)

ORGANIZATIONS, HOTLINES, AND WEBSITES

The Internet addresses listed here were accurate at the time of publication.

Centers for Disease Control and Prevention. Through phone, fax, and the Internet, the CDC provides a wide variety of health information.
<http://www.cdc.gov>

Federal Trade Commission: Consumer Protection—Health. Includes online brochures about a variety of consumer health topics, including fitness equipment, generic drugs, and fraudulent health claims.
<http://www.ftc.gov/bcp/menus/consumer/health.shtm>

Healthfinder. A gateway to online publications, websites, support and self-help groups, and agencies and organizations that produce reliable health information.
<http://www.healthfinder.gov>

Healthy People 2020. Provides information on Healthy People objectives and priority areas.
<http://www.healthypeople.gov>

MedlinePlus. Provides links to news and reliable information about health from government agencies and professional associations; also includes a health encyclopedia and information about prescription and over-the-counter drugs.
<http://www.nlm.nih.gov/medlineplus/>

National Health Information Center (NHIC). Puts consumers in touch with the organizations that are best able to provide answers to health-related questions.
<http://www.health.gov/nhic>

National Institutes of Health. Provides information about all NIH activities as well as consumer publications, hotline information, and an A-to-Z listing of health issues with links to the appropriate NIH institute.

<http://www.nih.gov>

National Wellness Institute. Serves professionals and organizations that promote health and wellness.

<http://www.nationalwellness.org>

National Women's Health Information Center. Provides information and answers to frequently asked questions.

<http://www.womenshealth.gov>

Office of Minority Health. Promotes improved health among racial and ethnic minority populations.

<http://minorityhealth.hhs.gov>

Surgeon General. Includes information on activities of the Surgeon General and the text of many key reports on such topics as tobacco use, physical activity, and mental health.

<http://www.surgeongeneral.gov>

World Health Organization (WHO). Provides information about health topics and issues affecting people around the world.

<http://www.who.int/en>

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BEHAVIOR CHANGE STRATEGY

Behavior Change Contract

1. I, _____, agree to _____

2. I will begin on _____ and plan to reach my goal of _____
_____ by _____
3. To reach my final goal, I have devised the following schedule of mini-goals. For each step in my program, I will give myself the reward listed.

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

My overall reward for reaching my goal will be _____

4. I have gathered and analyzed data on my target behavior and have identified the following strategies for changing my behavior:

5. I will use the following tools to monitor my progress toward my final goal:

I sign this contract as an indication of my personal commitment to reach my goal: _____

I have recruited a helper who will witness my contract and _____

2

CHAPTER

Stress: The Constant Challenge

LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain what stress is and how people react to it—physically, emotionally, and behaviorally
- Describe the relationship between stress and disease
- List common sources of stress
- Describe techniques for preventing and managing stress
- Put together a plan for successfully managing the stress in your life

TEST YOUR KNOWLEDGE

1. Which of the following events can cause stress?
 - a. taking out a loan
 - b. failing a test
 - c. graduating from college
2. Exercise stimulates which of the following?
 - a. analgesia (pain relief)
 - b. birth of new brain cells
 - c. relaxation
3. High levels of stress can impair memory and cause physical changes in the brain.
True or false?
4. Which of the following can result from chronic stress?
 - a. violence
 - b. heart attack
 - c. stroke
5. Because eating induces relaxation, it is an excellent means of coping with stress.
True or false?

ANSWERS

1. **ALL THREE.** Stress-producing factors can be pleasant or unpleasant and can include physical challenges, goal achievement, and events that are perceived as negative.
2. **ALL THREE.** Regular exercise is linked to improvements in many dimensions of wellness.
3. **TRUE.** Low levels of stress may improve memory, but high stress levels impair learning and memory.
4. **ALL THREE.** Chronic—or ongoing—stress can last for years. People who suffer from long-term stress may ultimately become violent toward themselves or others. They also run a greater-than-normal risk for certain ailments, especially cardiovascular disease.
5. **FALSE.** Eating to cope with stress may lead to weight gain and to binge eating, a behavior associated with eating disorders.

Like the term *wellness*, *stress* is a word many people use without understanding its precise meaning. Stress is popularly viewed as an uncomfortable response to a negative event, which probably describes *nervous tension* more than the cluster of physical and psychological responses that actually constitute stress. In fact, stress is not limited to negative situations; it is also a response to pleasurable physical challenges and the achievement of personal goals.

Whether stress is experienced as pleasant or unpleasant depends largely on the situation and the individual. Because learning effective responses to stress can enhance psychological health and help prevent a number of serious diseases, stress management can be an important part of daily life.

As a college student, you may be in one of the most stressful times of your life (see the box titled “The Perceived Stress Scale”). This chapter explains the physiological and psychological reactions that make up the stress response

and describes how these reactions can put your health at risk. The chapter also presents methods of managing stress.

WHAT IS STRESS?

In common usage, the term *stress* refers to two different things: situations that trigger physical and emotional reactions, *and* the reactions themselves. This text uses the more precise term **stressor** for a physical or psychological event that triggers physical and emotional reactions and the term **stress response** for the reactions themselves. A first date and a final exam are examples of stressors; sweaty palms and a pounding heart are symptoms of the stress response. We'll use the term **stress** to describe the general physical and emotional state that accompanies the stress response. So a person taking a final exam experiences stress.

Each individual's experience of stress depends on many factors, including the nature of the stressor and how it is perceived. Stressors take many different forms. Some occur suddenly and don't last long or repeat, like a fire in the building you live in. Others, like air pollution or quarreling parents, can continue for a long time. The memory of a stressful occurrence can itself be a stressor years after the event, such as the memory of the loss of a loved one. Responses to stressors can include a wide variety of physical, emotional, and behavioral changes. A short-term response might be an upset stomach or insomnia, whereas a long-term response might be a change in your personality or social relations.

Physical Responses to Stressors

Imagine a close call: As you step off the curb, a car careens toward you. With just a fraction of a second to spare, you leap safely out of harm's way. In that split second of danger and in the moments following it, you experience a predictable series of physical reactions. Your body goes from a relaxed state to one prepared for physical action to cope with a threat to your life.

Two systems in your body are responsible for your physical response to stressors: the nervous system and the endocrine system. Through rapid chemical reactions affecting almost every part of your body, you are primed to act quickly and appropriately in time of danger.

Actions of the Nervous System The **nervous system** consists of the brain, spinal cord, and nerves. Part of the nervous system is under voluntary control, as when you tell your arm to reach for a chocolate. The part that is not under conscious supervision—for example, the part that controls the digestion of the chocolate—is the **autonomic nervous system**. In addition to digestion, it controls your heart rate, breathing, blood pressure, and hundreds of other involuntary functions.

The autonomic nervous system consists of two divisions:

- The **parasympathetic division** is in control when you are relaxed. It aids in digesting food, storing energy, and promoting growth.
- The **sympathetic division** is activated during times of arousal, including exercise, and when there is an emergency, such as severe pain, anger, or fear.

Sympathetic nerves use the neurotransmitter **norepinephrine** to exert their actions on nearly every organ, sweat gland, blood vessel, and muscle to enable your body to handle an emergency. The sympathetic division commands your body to stop storing energy and to use it in response to a crisis.

Actions of the Endocrine System During stress, the sympathetic nervous system triggers the **endocrine system**. This system of glands, tissues, and cells helps control body functions by releasing **hormones** and other chemical messengers into the bloodstream to influence metabolism and other body processes. These chemicals act on a variety of targets throughout the body. Along with the nervous system, the endocrine system prepares the body to respond to a stressor.

The Two Systems Together How do both systems work together in an emergency? Let's go back to your near collision with a car. Both reflexes and higher cognitive areas in your brain quickly make the decision that you are facing a threat, and your body prepares to meet the danger. Chemical messages and the actions of sympathetic nerves cause the release of key hormones, including **cortisol** and **epinephrine**. These hormones trigger the physiological changes shown in Figure 2.1, including these:

- Heart and respiration rates accelerate to speed oxygen through the body.
- Hearing and vision become more acute.
- The liver releases extra sugar into the bloodstream to boost energy.
- Perspiration increases to cool the skin.
- The brain releases **endorphins**—chemicals that can inhibit or block sensations of pain—in case you are injured.

TERMS

stressor Any physical or psychological event or condition that produces physical and emotional reactions.

stress response The physical and emotional reactions to a stressor.

stress The general physical and emotional state that accompanies the stress response.

nervous system The brain, spinal cord, and nerves.

autonomic nervous system The branch of the nervous system that controls basic body processes; consists of the sympathetic and parasympathetic divisions.

parasympathetic division A division of the autonomic nervous system that moderates the excitatory effect of the sympathetic division, slowing metabolism and restoring energy supplies.

sympathetic division A division of the autonomic nervous system that reacts to danger or other challenges by accelerating body processes.

norepinephrine A neurotransmitter released by the sympathetic nervous system into specific tissues to increase their function in the face of increased activity; when released by the brain, causes arousal (increased attention, awareness, and alertness); also called *noradrenaline*.

endocrine system The system of glands, tissues, and cells that secrete hormones into the bloodstream to influence metabolism and other body processes.

hormone A chemical messenger produced in the body and transported in the bloodstream to target cells or organs for specific regulation of their activities.

cortisol A steroid hormone secreted by the cortex (outer layer) of the adrenal gland; also called *hydrocortisone*.

epinephrine A hormone secreted by the medulla (inner core) of the adrenal gland that affects the functioning of organs involved in responding to a stressor; also called *adrenaline*.

endorphins Brain secretions that have pain-inhibiting effects.

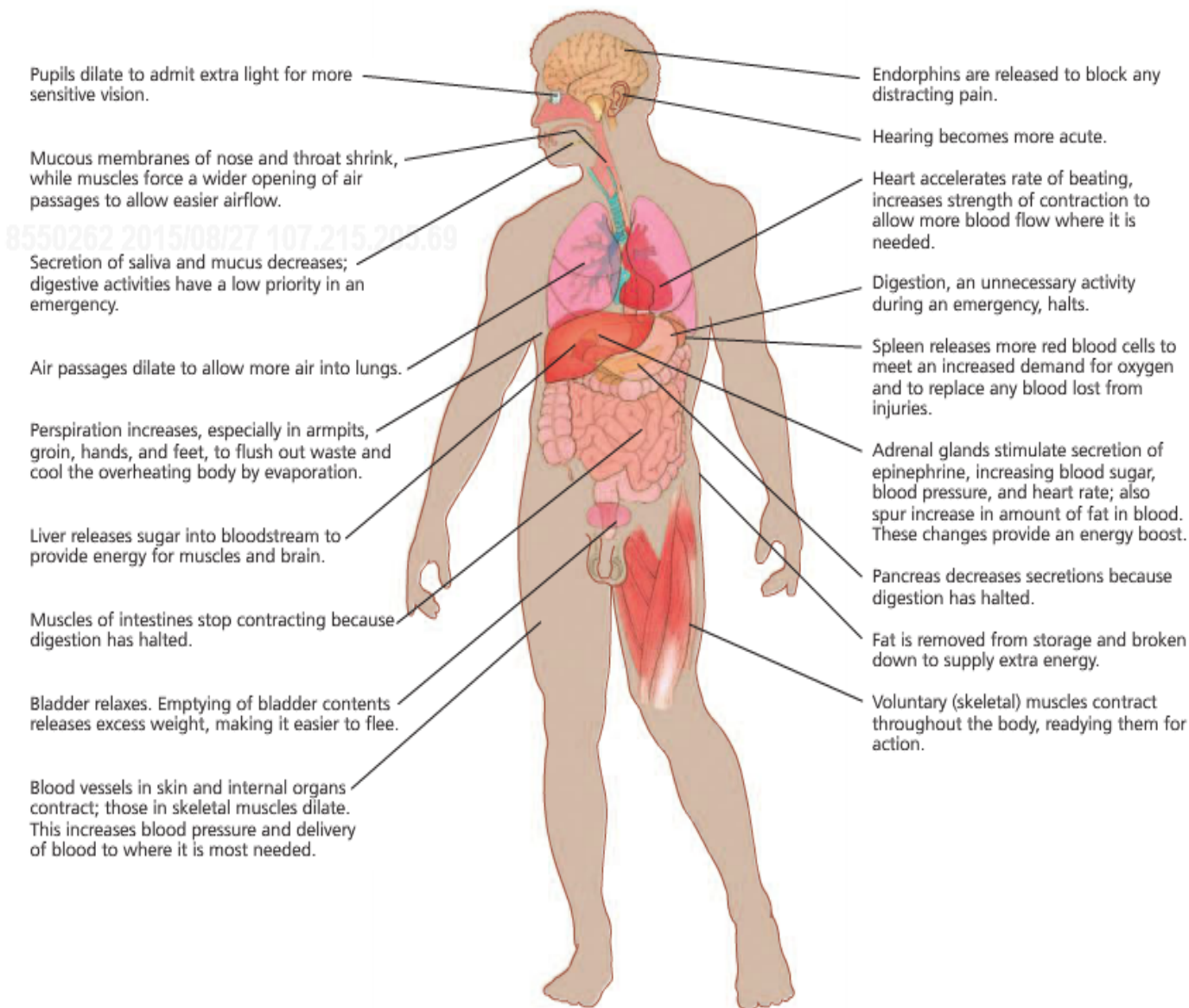


FIGURE 2.1 The fight-or-flight reaction. In response to a stressor, the autonomic nervous system and the endocrine system prepare the body to deal with an emergency.

Taken together, these nearly instantaneous physical changes are called the **fight-or-flight reaction**. They give you the heightened reflexes and strength you need to dodge the car or deal with other stressors. Although these physical changes may vary in intensity, the same basic set of physical reactions occurs in response to any type of stressor—positive or negative, physical or psychological.

The Return to Homeostasis Once a stressful situation ends, the parasympathetic division of your autonomic nervous system takes command and halts the stress response. It restores **homeostasis**, a state in which blood pressure, heart rate, hormone levels, and other vital functions are maintained within a narrow range of normal. Your parasympathetic nervous system calms your body down, slowing a rapid heartbeat, drying sweaty palms, and returning breathing to normal.

Gradually your body resumes its normal “housekeeping” functions, such as digestion and temperature regulation. Damage that may have been sustained during the fight-or-flight reaction is repaired. The day after you narrowly dodge the car, you wake up feeling fine. In this way, your body can grow, repair itself, and acquire new reserves of energy. When the next crisis comes, you’ll be ready to respond again instantly.

fight-or-flight reaction A defense reaction that prepares a person for conflict or escape by triggering hormonal, cardiovascular, metabolic, and other changes.

homeostasis A state of stability and consistency in an individual’s physiological functioning.

TERMS

ASSESS YOURSELF The Perceived Stress Scale



Many symptoms of excess stress are easy to notice. The following test can help you determine how much stress you have experienced in the past week.

Answer each question with a number: Never = 0; Almost never = 1; Sometimes = 2; Fairly often = 3; Very often = 4.

In the past week, how often have you . . .

1. Been upset because of something that happened unexpectedly?
2. Felt that you were unable to control the important things in your life?
3. Felt nervous and “stressed”?
4. *Felt confident about your ability to handle your personal problems?
5. *Felt that things were going your way?
6. Found that you could not cope with all the things you had to do?
7. *Been able to control irritations in your life?
8. *Felt that you were on top of things?
9. Been angered because things happened that were outside of your control?
10. Felt difficulties were piling up so high that you could not overcome them?

To calculate your score, add your answers to questions 1, 2, 3, 6, 9, and 10, and subtract your answers to questions 4, 5, 7, and 8 (the questions with the asterisks). The result is your total score. Add your answers to find your score.

If your total score is above 14, you should take time to develop effective stress management techniques. This chapter describes many coping strategies that can aid you in dealing with college stressors. Your school’s counseling center also can provide valuable support.

SOURCE: Reprinted by permission from the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). “A global measure of perceived stress.” *Journal of Health and Social Behavior*, 24, 386–396.

The Fight-or-Flight Reaction in Modern Life The fight-or-flight reaction is a part of our biological heritage, and it’s a survival mechanism that has served humans well. In modern life, however, it is often absurdly inappropriate. Many of the stressors we face in everyday life do not require a physical response—for example, an exam, a mess left by a roommate, or a stoplight. The fight-or-flight reaction prepares the body for physical action regardless of whether such action is a necessary or appropriate response to a particular stressor.

Emotional and Behavioral Responses to Stressors

We all experience a similar set of physical responses to stressors, which make up the fight-or-flight reaction. These responses, however, vary from person to person and from one situation to another. People’s perceptions of potential stressors—and of their reactions to such stressors—also vary greatly. For example, you may feel confident about taking exams but be nervous about talking to people you don’t know, while your roommate may love challenging social situations but

may be nervous about taking tests. Many factors, some external and some internal, help explain these differences.

Your cognitive (mental) appraisal of a potential stressor strongly influences how you view it. Two factors that can reduce the magnitude of the stress response are successful prediction and the perception of control. For instance, receiving a course syllabus at the beginning of the term allows you to predict the timing of major deadlines and exams. Having this predictive knowledge also allows you to exert some control over your study plans and can help reduce the stress caused by exams.

Cognitive appraisal is highly individual and strongly related to emotions. The facts of a situation—Who? What? Where? When?—typically are evaluated fairly consistently from person to person. But evaluation with respect to personal outcome varies: What does this mean for me? Can I do anything about it? Will it improve or worsen? If a person perceives a situation as exceeding her or his ability to cope, the result can be negative emotions and an inappropriate stress response. If, on the other hand, a person perceives a situation as a challenge that is within her or his ability to

QUICK

STATS

86% of college students reported feeling overwhelmed by their workload at least once in the last year.

—ACHA–NCHA, 2011

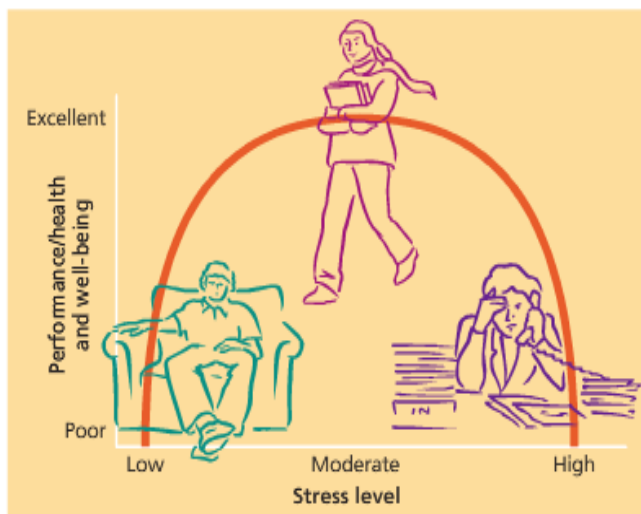


FIGURE 2.2 Stress level, performance, and well-being.

A moderate level of stress challenges individuals in a way that promotes optimal performance and well-being. Too little stress, and people are not challenged enough to improve; too much stress, and the challenges become stressors that can impair physical and emotional health.

manage, more positive and appropriate responses are likely. A certain amount of stress, if coped with appropriately, can help promote optimal performance (Figure 2.2).

Effective and Ineffective Responses

Common emotional responses to stressors include anxiety, depression, and fear. Although emotional responses are determined in part by inborn personality or temperament, we often can moderate or learn to control them. Coping techniques are discussed later in the chapter.

Behavioral responses to stressors—controlled by the **somatic nervous system**, which manages our conscious actions—are entirely under our control. Effective behavioral responses such as talking, laughing, exercising, meditating, learning time management skills, and becoming more assertive can promote wellness and enable us to function at our best. Ineffective behavioral responses to stressors include overeating, expressing hostility, and using tobacco, alcohol, or other drugs.

Personality and Stress Some people seem to be nervous, irritable, and easily upset by minor annoyances. Others are calm and composed even in difficult situations. Scientists remain unsure just why this is or how the brain's complex emotional mechanisms work. But **personality**—the sum of cognitive, behavioral, and emotional tendencies—clearly affects how people perceive and react to stressors. To investigate the links among personality, stress, and wellness, researchers examine different clusters of characteristics, or “personality types”:

- **Type A.** People with Type A personality are described as ultracompetitive, controlling, impatient, aggressive, and even hostile. Type A people have a higher perceived stress

level and more problems coping with stress. They react explosively to stressors and are upset by events that others would consider only annoyances. Studies indicate that certain characteristics of the Type A pattern—anger, cynicism, and hostility—increase the risk of heart disease.

- **Type B.** The Type B personality is relaxed and contemplative. Type B people are less frustrated by daily events and more tolerant of the behavior of others.

- **Type C.** The Type C personality is characterized by anger suppression, difficulty expressing emotions, feelings of hopelessness and despair, and an exaggerated response to minor stressors. This heightened response may impair immune functions.

Studies of Type A and C personalities suggest that expressing emotions is beneficial, but habitually expressing exaggerated stress responses or hostility is unhealthy.

Researchers have also looked for personality traits that enable people to deal more successfully with stress. One such trait is **hardiness**, a particular form of optimism. People with a hardy personality view potential stressors as challenges and opportunities for growth and learning, rather than as burdens. They see fewer situations as stressful and react less intensely to stress

than nonhardy people might. Hardy people are committed to their activities, have a sense of inner purpose and an inner locus of control, and feel at least partly in control of their lives.

The term **resilience** refers to personality traits associated with social and academic success in at-risk populations, such as people from low-income families and those with mental or physical disabilities. Resilient people tend to set goals and face adversity through individual effort. There are

three basic types of resilience, and each one determines how a person responds to stress:

- **Nonreactive resilience**, in which a person does not react to a stressor.
- **Homeostatic resilience**, in which a person may react strongly but returns to baseline functioning quickly.
- **Positive growth resilience**, in which a person learns and grows from the stress experience.

Resilience is associated with emotional intelligence and violence prevention.

You probably can't change your basic personality, but you can change your typical behaviors and patterns of thinking. You can also use positive stress management techniques like those described later in the chapter.

Effective behavioral responses can lessen stress; ineffective ones only worsen it.

somatic nervous system The branch of the peripheral nervous system that governs motor functions and sensory information, largely under conscious control.

personality The sum of behavioral, cognitive, and emotional tendencies.

TERMS

Cultural Background Young adults from around the world come to America for a higher education; most students finish college with a greater appreciation for other cultures and worldviews. The clash of cultures, however, can be a big source of stress for many students—especially when it leads to disrespectful treatment, harassment, or violence. It is important to remember that everyone’s reaction to stress is influenced by his or her family and cultural background. Learning to accept and appreciate the cultural backgrounds of other people is both a mind-opening experience and a way to avoid stress over cultural differences.

Gender Our **gender role**—the activities, abilities, and behaviors our culture expects of us based on our sex—can affect our experience of stress. Some behavioral responses to stressors, such as crying or openly expressing anger, may be deemed more appropriate for one gender than the other.

Strict adherence to gender roles, however, can limit one’s response to stress and can itself become a source of stress. Gender roles can also affect one’s perception of a stressor. If a man derives most of his self-worth from his work, for example,

retirement may be more stressful for him than for a woman whose self-image is based on several different roles.

In early 2012 the American Psychological Association released the results of its “Stress in America 2011” survey. The survey shows the different views American men and women have of their personal stress. In the latest survey, about 45% of both men and women said they were dissatisfied with their lives, but when asked to rate their stress levels on a scale of 1–10, women generally reported a significantly higher level of stress than men. The survey also shows that women are more likely than men to cope with stress through behaviors such as reading, spending time with friends, or meditating. Men are more likely to manage stress by playing sports.

Levels of testosterone (the primary male hormone, responsible for many masculine traits) increase in men from puberty onward, so men tend to have higher blood pressure than women of the same age. This factor contributes to greater wear on the male circulatory system, sometimes increasing a man’s risk for cardiovascular disease. A part of the brain that regulates emotions, the amygdala, is sensitive to testosterone. This may be one reason why men are more likely than women to find certain situations (such as social interactions) to be stressful.

Conversely, women have higher levels of oxytocin (a hormone involved in social interaction and mood regulation) and are more likely to respond to stressors by seeking social support. This coping response may give women a longevity advantage over men by decreasing the risk of some stress-related disorders. It does not, however, free women from stress-related ailments, and women are more likely than men to suffer stress-related hypertension, depression, and obesity.

Experience Past experiences can profoundly influence the evaluation of a potential stressor. Consider someone who has had a bad experience giving a speech in the past. He or she is much more likely to perceive an upcoming speech as stressful than someone who has had positive public speaking experiences.



A person’s emotional and behavioral responses to stressors depend on many different factor, including personality, gender, and cultural background. For example, research suggests that women are more likely than men to respond to stressors by seeking social support.

The Stress Experience as a Whole

As Table 2.1 shows, the physical, emotional, and behavioral symptoms of excess negative stress are distinct. But they are also intimately interrelated. The more intense the emotional response, the stronger the physical response. Effective behavioral responses can lessen stress; ineffective ones only worsen it. Sometimes people have such intense responses to stressors or such ineffective coping techniques that they need professional help to overcome the stress in their lives. More often, however, people can learn to handle stressors on their own.

gender role A culturally expected pattern of behavior and attitudes determined by a person’s sex.

TERMS

Table 2.1**Symptoms of Excess Stress**

PHYSICAL SYMPTOMS	EMOTIONAL SYMPTOMS	BEHAVIORAL SYMPTOMS
Dry mouth	Anxiety	Crying
Excessive perspiration	Depression	Disrupted eating habits
Frequent illnesses	Edginess	Disrupted sleeping habits
Gastrointestinal problems	Fatigue	Harsh treatment of others
Grinding of teeth	Hypervigilance	Problems communicating
Headaches	Impulsiveness	Sexual problems
High blood pressure	Inability to concentrate	Social isolation
Pounding heart	Irritability	Increased use of tobacco, alcohol, or other drugs
Stiff neck or aching lower back	Trouble remembering things	

STRESS AND HEALTH

According to the American Psychological Association, 76% of the general population report suffering physical symptoms related to stress (such as tense muscles or headaches), and 71% report nonphysical symptoms. The role of stress in health is complex, but evidence suggests that stress can increase vulnerability to many ailments. Several theories have been proposed to explain the relationship between stress and disease.

The General Adaptation Syndrome

Biologist Hans Selye was one of the first scientists to develop a comprehensive theory of stress and disease. Based on his work in the 1930s and 1940s, Selye coined the term **general adaptation syndrome (GAS)** to describe what he believed to be a universal and predictable response pattern to all stressors. As mentioned earlier, some stressors (such as attending a party) are pleasant, and others (such as getting a bad grade) are unpleasant. In the GAS theory, the stress triggered by a pleasant stressor is called **eustress**; stress brought on by an unpleasant stressor is called **distress**. The sequence of physical responses associated with GAS is the same for eustress and distress and occurs in three stages (Figure 2.3):

- **Alarm.** The alarm stage includes the complex sequence of events brought on by the fight-or-flight reaction. At this stage, the body is more susceptible to disease or injury

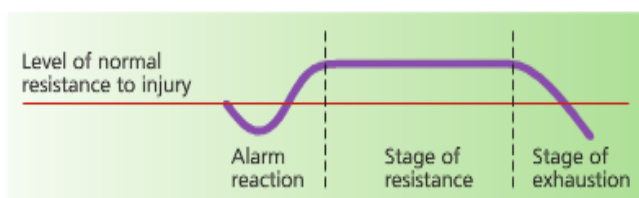


FIGURE 2.3 The general adaptation syndrome. During the alarm phase, a lower resistance to injury is evident. With continued stress, resistance to injury is actually enhanced. With prolonged exposure to repeated stressors, exhaustion sets in, with a return of low resistance levels seen during acute stress.

because it is geared up to deal with a crisis. Someone in this stage may experience headaches, indigestion, anxiety, and disrupted eating or sleep patterns.

- **Resistance.** With continued stress, the body develops a new level of homeostasis in which it is more resistant to disease and injury than usual. In this stage, a person can cope with normal life and added stress.
- **Exhaustion.** The first two stages of GAS require a great deal of energy. If a stressor persists, or if several stressors occur in succession, general exhaustion sets in. This is not the sort of exhaustion you feel after a long, busy day. Rather, it's a life-threatening type of physiological exhaustion.

Allostatic Load

Although the GAS model is still viewed as a key conceptual contribution to the understanding of stress, some aspects of it are considered outdated. For example, increased susceptibility to disease after repeated or prolonged stress is now thought to be due to the effects of the stress response itself

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think of the last time you faced a significant stressor. How did you respond? List the physical, emotional, and behavioral reactions you experienced. Did these responses help you deal with the stress, or did they interfere with your efforts to handle it?



TERMS

general adaptation syndrome (GAS) A pattern of stress responses consisting of three stages: alarm, resistance, and exhaustion.

eustress Stress resulting from a pleasant stressor.

distress Stress resulting from an unpleasant stressor.

rather than to a depletion of resources (exhaustion state). In particular, long-term overexposure to stress hormones such as cortisol has been linked with health problems. Further, although physical stress reactions promote homeostasis (resistance stage), they also have negative effects on the body.

The long-term wear and tear of the stress response is called the **allostatic load**. A person's allostatic load depends on many factors, including genetics, life experiences, and emotional and behavioral responses to stressors. A high allostatic load may be due to frequent stressors, poor adaptation to common stressors, an inability to shut down the stress response, or imbalances in the stress response of different body systems. High allostatic load is linked to heart disease, hypertension, obesity, and reduced brain and immune system functioning. In other words, when your allostatic load exceeds your ability to cope, you are more likely to get sick.

Psychoneuroimmunology

One of the most fruitful areas of current research into the relationship between stress and disease is **psychoneuroimmunology (PNI)**. PNI is the study of the interactions among the nervous system, the endocrine system, and the immune system. The underlying premise of PNI is that stress, through the actions of the nervous and endocrine systems, impairs the immune system and thereby affects health.

A complex network of nerve and chemical connections exists between the nervous, endocrine, and immune systems. In general, increased levels of cortisol are linked to a decreased number of immune system cells, or *lymphocytes* (see Chapter 17 for more about the immune system). Epinephrine appears to promote the release of lymphocytes but at the same time reduces their efficiency. Scientists have identified hormone-like substances called *neuropeptides* that appear to translate stressful emotions into biochemical events, some of which impact the immune system, providing a physical link between emotions and immune function.

Different types of stress may affect immunity in different ways. For instance, during **acute stress** (typically lasting between 5 and 100 minutes), white blood cells move into the skin, where they enhance the immune response. During a stressful event sequence, such as a personal trauma and the events that follow, however, there are typically no overall significant immune changes. Chronic (ongoing) stressors such as unemployment have negative effects on almost all functional measures of immunity. **Chronic stress** may cause prolonged secretion of cortisol and may accelerate the course of diseases that involve inflammation, including multiple sclerosis, heart disease, and type 2 diabetes.

Mood, personality, behavior, and immune functioning are intertwined. For example, people who are generally pessimistic may neglect the basics of health care, become passive when ill, and fail to engage in health-promoting behaviors. People who are depressed may reduce physical activity and social

interaction, which may in turn affect the immune system and the cognitive appraisal of a stressor. Optimism, successful coping, and positive problem solving, on the other hand, may positively influence immunity.

Links between Stress and Specific Conditions

Although much remains to be learned, it is clear that people who have unresolved chronic stress in their lives or who handle stressors poorly are at risk for a wide range of health problems. In the short term, the problem might be just a cold, a stiff neck, or a stomachache. Over the long term, the problems can be more severe—cardiovascular disease (CVD), high blood pressure, impaired immune function, or a host of other problems.

Cardiovascular Disease During the stress response, heart rate increases and blood vessels constrict, causing blood pressure to rise. Chronic high blood pressure is a major cause of *atherosclerosis*, a disease in which blood vessels become damaged and caked with fatty deposits. These deposits can block arteries, causing heart attacks and strokes. The stress response can precipitate a heart attack in someone with atherosclerosis. The stress response can also cause stress cardiomyopathy (“broken heart syndrome”), a condition that mimics a heart attack but doesn’t damage the heart.

Certain emotional responses may increase a person’s risk of CVD. As described earlier, people who tend to react to situations with anger and hostility are more likely to have heart attacks than are people with less explosive, more trusting personalities.

QUICK STATS

About one-half of American adults have at least one chronic illness.

—CDC, 2010

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever been so stressed that you felt ill in some way? If so, what were your symptoms? How did you handle them? Did the experience affect the way you reacted to other stressful events?

allostatic load The long-term negative impact of the stress response on the body.

psychoneuroimmunology (PNI) The study of the interactions among the nervous, endocrine, and immune systems.

acute stress Stress immediately following a stressor; may last only minutes or may turn into chronic stress.

chronic stress Stress that continues for days, weeks, or longer.

TERMS

Stress has also been linked to other risk factors for CVD, including elevated cholesterol. For example, inflammation is a key component of the damage to blood vessels that leads to heart attacks. Stress increases inflammation throughout the body. Stress-induced increases in inflammatory messenger molecules are also linked to elevated levels of homocysteine and C-reactive protein (CRP), two compounds that appear to be markers for CVD risk. Stress-related depression and anger are associated with elevated homocysteine levels, and job-related exhaustion is linked to high CRP levels in some people. Elevated CRP levels have also been implicated in insulin resistance and the development of diabetes, which is in turn a risk factor for CVD. Clearly stress reduction can improve cardiovascular health. See Chapter 15 for more about CVD.

Psychological Problems The hormones and other chemicals released during the stress response cause emotional as well as physical changes. Stress also activates the

QUICK STATS

11% of adult Americans suffer serious psychological distress.

—SAMHSA, 2009

enzyme PKC, which influences the brain's prefrontal cortex. Excess PKC can negatively affect focus, judgment, and the ability to think clearly. Moreover, many stressors are inherently anxiety-producing, depressing, or both. Stress has been found to contribute to psychological problems such as depression, panic attacks, anxiety, eating disorders, and posttraumatic stress disorder (PTSD). PTSD, which afflicts war veterans, rape and child abuse survivors, and others who have suffered or witnessed severe trauma, is characterized by nightmares, flashbacks, and a diminished capacity to experience or express emotion. (For information about psychological health, see Chapter 3.)

Altered Immune Function PNI research helps explain how stress affects the immune system. Some of the health problems linked to stress-related changes in immune function include vulnerability to colds and other infections, asthma and allergy attacks, susceptibility to cancer, and flare-ups of chronic diseases such as genital herpes and HIV infection.

Headaches More than 45 million Americans suffer from chronic, recurrent headaches. Headaches come in various types but are often grouped into the three following categories:

- **Tension headaches.** Approximately 90% of all headaches are tension headaches, characterized by a dull, steady pain, usually on both sides of the head. It may feel as though a band of pressure is tightening around the head, and the pain may extend to the neck and shoulders. Acute tension headaches may last from hours to days, while chronic tension headaches may occur almost every day for months or even years. Psychological stress, poor posture, and immobility are the leading causes of tension headaches. There is no cure, but the pain can sometimes be relieved with over-the-counter painkillers and with therapies such as massage, acupuncture, relaxation, hot or cold showers, and rest.
- **Migraine headaches.** Migraines typically progress through a series of stages lasting from several minutes to several days. They may produce a variety of symptoms, including throbbing pain that starts on one side of the head and may spread, heightened sensitivity to light, visual disturbances such as flashing lights or temporary blindness, nausea, dizziness, and fatigue. About 70% of migraine sufferers are women, and migraine headaches may have a genetic component. Potential triggers include menstruation, stress, fatigue, atmospheric changes, bright light, specific sounds or odors, and certain foods. The frequency of attacks varies from a few in a lifetime to several per week. Treatment can help reduce the frequency, severity, and duration of migraines. Aerobic exercise is frequently recommended as a treatment for migraine headaches. However, the evidence for the efficacy of exercise to reduce the frequency and severity of migraine headaches is mixed. There is mild evidence that exercise may reduce stress levels, a known trigger for migraine headaches.



Ongoing stress has been shown to make people more vulnerable to everyday ailments, such as colds and allergies.

Researchers have not been able to replicate these findings consistently, however. Several studies have failed to show exercise as an effective treatment for migraine headaches. And for some, exercise itself can trigger migraines.

- **Cluster headaches.** Cluster headaches are extremely severe headaches that cause intense pain in and around one eye. They usually occur in clusters of one to three headaches each day over a period of weeks or months, alternating with periods of remission in which no headaches occur. About 90% of people with cluster headaches are male. There is no known cause or cure for cluster headaches, but a number of treatments are available. During cluster periods, it is important to refrain from smoking cigarettes and drinking alcohol, because these activities can trigger attacks.

For more information on treating headaches and when a headache may signal a serious illness, see Appendix B.

Other Health Problems Many other health problems may be caused or worsened by excessive stress, including the following:

- Digestive problems such as stomachaches, diarrhea, constipation, irritable bowel syndrome, and ulcers
- Insomnia and fatigue
- Injuries, including on-the-job injuries caused by repetitive strain
- Menstrual irregularities, impotence, and pregnancy complications

COMMON SOURCES OF STRESS

Recognizing potential sources of stress is an important step in successfully managing the stress in your life.

Major Life Changes

Any major change in your life that requires adjustment and accommodation can be a source of stress. Early adulthood and the college years are associated with many significant changes, such as moving out of the family home. Even changes typically thought of as positive—graduation, job promotion, marriage—can be stressful.

Clusters of life changes, particularly those that are perceived negatively, may be linked to health problems in some people. Personality and coping skills, however, are important moderating influences. People with strong support networks and stress-resistant personalities are less likely to become ill in response to life changes than are people with fewer resources.

Daily Hassles

Although major life changes are stressful, they seldom occur regularly. Researchers have proposed that minor problems—life's daily hassles, such as losing your keys or wallet—can be

an even greater source of stress because they occur much more often.

People who perceive hassles negatively are likely to experience a moderate stress response every time they face one. Over time, this can take a significant toll on health. Studies indicate that for some people, daily hassles contribute to a general decrease in overall wellness.

College Stressors

College is a time of major changes and minor hassles. For many students, college means being away from home and family for the first time. Nearly all students share stresses like the following:

- **Academic stress.** Exams, grades, and an endless workload await every college student but can be especially troublesome for students just out of high school.
- **Interpersonal stress.** Most students are more than just students; they are also friends, children, employees, spouses, parents, and so on. Managing relationships while juggling the rigors of college life can be daunting, especially if some friends or family members are less than supportive.
- **Time pressures.** Class schedules, assignments, and deadlines are an inescapable part of college life. But these time pressures can be drastically compounded for students who also have job or family responsibilities.
- **Financial concerns.** The majority of college students need financial aid not just to cover the cost of tuition but also to survive from day to day while in school. For many, college life isn't possible without a job, and the pressure to stay afloat financially competes with academic and other stressors.
- **Worries about the future.** As college comes to an end, students face life after college. This means thinking about a career, choosing a place to live, and leaving the friends and routines of school behind.

As mentioned earlier, test anxiety is a source of stress for many students. To learn some proven techniques for overcoming test anxiety, see the Behavior Change Strategy at the end of this chapter.

Job-Related Stressors

Americans rate their jobs as a key source of stress in their lives. Various surveys indicate that 40–50% of working Americans say they typically feel tense or stressed out while at work. Tight schedules and overtime leave less time to exercise, socialize, and engage in other stress-proofing activities. While daily work activities can be stressful enough on their own, stress can be even worse for people who are left out of important decisions relating to their jobs. When workers are given the opportunity to shape how their jobs are performed, job satisfaction goes up and stress levels go down.



DIVERSITY MATTERS

Diverse Populations, Discrimination, and Stress

Stress is universal, but an individual's response to stress can vary depending on gender, cultural background, prior experience, and genetic factors. In diverse multi-ethnic and multicultural nations such as the United States, some groups face special stressors and have higher-than-average rates of stress-related physical and emotional problems. These groups include ethnic minorities, the poor, those with physical or mental disabilities, and those with atypical sexual orientations.

Discrimination occurs when people speak or act according to their prejudices—biased, negative beliefs or attitudes toward some group. A blatant example is painting a swastika on a Jewish studies house. A more subtle example is when an African American student notices that white shopkeepers in a mostly white college town tend to keep a close eye on him.

Recent immigrants to the United States have to learn to live in a new society. This

requires a balance between assimilating and changing to be like the majority, and maintaining a connection to their own culture, language, and religion. The process of acculturation is generally stressful, especially when the person's background is radically different from that of the people he or she is now living among.

Both immigrants and minorities that have lived for generations in the United States can face job- and school-related stressors because of stereotypes and discrimination. They may make less money in comparable jobs with comparable levels of education and may find it more difficult to achieve leadership positions.

On a positive note, however, many who experience hardship, disability, or prejudice develop effective goal-directed coping skills and are successful at overcoming obstacles and managing the stress they face.



If job-related (or college-related) stress is severe or chronic, the result can be **burnout**—a state of physical, mental, and emotional exhaustion. Burnout occurs most often in highly motivated and driven individuals who come to feel that their work is not recognized or that they are not accomplishing their goals. People in the helping professions—teachers, social workers, caregivers, police officers, and so on—are also prone to burnout. For some people who suffer from burnout, a vacation or leave of absence may be appropriate. For others, a reduced work schedule, better communication with superiors, or a change in job goals may be necessary. Improving time management skills can also help.

Social Stressors

Social networks can be real or virtual. Both types can help improve your ability to deal with stress, but any social network can also become a stressor in itself.

burnout A state of physical, mental, and emotional exhaustion.

TERMS

Real Social Networks Although social support is a key buffer against stress, your interactions with others can themselves be a source of stress. The college years, in particular, can be a time of great change in interpersonal relationships. The larger community where you live can also act as a stressor.

Social stressors include prejudice and discrimination. You may feel stress as you try to relate to people of other ethnic or socioeconomic groups. If you are a member of a minority ethnic group, you may feel pressure to assimilate into mainstream society, or to spend as much time as possible with others who share your ethnicity or background. If English is not your first language, you may face the added burden of conducting daily activities in a language with which you are not comfortable. All these pressures can become significant sources of stress. (See the box “Diverse Populations, Discrimination, and Stress.”)

Virtual Social Networks Technology can help you save time, but it can also increase stress. Being electronically connected to work, family, and friends all the time can impinge on your personal space, waste time, and distract you from your current real situation. If you are “always on”—that is, always available by voice or text messaging—some friends or colleagues may think it's all right to contact you anytime, even if you're in class or trying to work, and they may expect

WELLNESS ON CAMPUS

Coping with News of Traumatic Events



We are continually exposed to news of tragic events. Natural disasters, war, terrorism, and poverty are all catastrophic events that we seem to hear about daily. Both experiencing trauma and observing it can result in extreme stress, requiring time and effort to recover. Such events can weaken your sense of security and create uncertainty about how the future may unfold. People react to such news in different ways, depending on their proximity to the event and its recency. People far from the site may suffer emotional reactions simply from watching endless coverage on television.

Responses to trauma include disbelief, shock, fear, anger, resentment, anxiety, mood swings, irritability, sadness, depression, panic, guilt, apathy, feelings of isolation or powerlessness, and many of the symptoms of excess stress. Some people affected by such violence develop post-traumatic stress disorder (PTSD), a more serious condition.

In the case of the 2007 shooting rampage at Virginia Polytechnic Institute and State University (Virginia Tech) that left 32 students and teachers dead, the school and community mobilized quickly to respond to the expected surge in behavioral health needs generated by the attack. Hotline calls and emergency room visits increased dramatically, especially during the second



and third weeks following the shootings. Information sources and support groups were established for people grieving the loss of friends, family, neighbors, or colleagues. Volunteers contacted each family that was directly affected by the shootings to offer help in making arrangements and to provide other services.

If you are affected by a disastrous event such as a school shooting or terrorist attack, take these steps:

- Be sure you have the best information about what happened, whether a continuing risk is present, and what you can do to avoid it. That information may be posted on websites or on local radio or TV stations.
- Don't expose yourself to so much media coverage that it overwhelms you.
- Take care of yourself. Use the stress relief techniques discussed in this chapter.
- Share your feelings and concerns with others. Be a supportive listener.

- If you feel able, help others in any way you can, such as by volunteering to work with victims.
- If you feel emotionally distressed days or weeks after the event, consider asking for professional help.

an immediate response. The convenience of staying electronically connected comes at a price.

Environmental Stressors

Have you tried to eat at a restaurant where the food was great, but the atmosphere was so noisy that it put you on edge? This is an example of an environmental stressor—a condition or event in the physical environment that causes stress. Examples of typical environmental stressors include the following:

- Natural disasters
- Acts of violence
- Industrial accidents
- Intrusive noises or smells

Like the noisy atmosphere of some restaurants, many environmental stressors are mere inconveniences that are easy

to avoid. Others, such as pollen or construction noise, may be unavoidable daily sources of stress. For those who live in poor or violent neighborhoods or in a war-torn country, the environment can contain major stressors (see the box “Coping with News of Traumatic Events”).

Internal Stressors

Some stressors are found not in our environment but within ourselves. We pressure ourselves to reach goals and continually evaluate our progress and performance. Striving to reach goals can enhance self-esteem if the goals are reasonable. Unrealistic expectations, however, can be a significant source of stress and can damage self-esteem. Other internal stressors are physical and emotional states such as illness and exhaustion; these can be both a cause and an effect of unmanaged stress.

Some stressors are found within ourselves.

MANAGING STRESS

You can control the stress in your life by taking the following steps:

- Shore up your support system.
- Improve your communication skills.
- Develop healthy exercise, eating, and sleeping habits.
- Learn to identify and moderate individual stressors.

The effort required is well worth the time. People who manage stress effectively not only are healthier but have more time to enjoy life and accomplish goals.

Social Support

Having the support of friends and family members seems to contribute to the well-being of body and mind. Research supports this conclusion, as the following examples demonstrate:

- Among college students living in overcrowded apartments, a study revealed that those students with a strong social support system were less distressed by their cramped quarters than were the loners who navigated life's challenges on their own.
- Young adults who have strong relationships with their parents tend to cope with stress better than peers with poor parental relationships.
- Many studies show that married people live longer than single people (including those who are divorced, widowed, or never married) and have lower death rates from practically all causes.

Social support can provide a critical counterbalance to the stress in our lives. Give yourself time to develop and maintain a network of people you can count on for emotional support, feedback, and nurturing. If you believe you don't have enough social support, consider becoming a volunteer to help build your network of friends and to enhance your spiritual well-being. (See the box "Altruism: Is Doing Good Good for Your Health?")

Communication

Communicating in an assertive way that respects the rights of others—while protecting your own rights—can prevent stressful situations from getting out of control.

Some people have trouble either telling others what they need or saying no to the needs of others. They may suppress their feelings of anger, frustration, and resentment, and they may end up feeling taken advantage of or suffering in unhealthy relationships. At the other extreme are people who express anger openly and directly by being verbally or physically

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are the top two or three stressors in your life right now? Are they new to your life—as part of your college experience—or are they stressors you've experienced in the past? Do they include both positive and negative experiences (eustress and distress)?

aggressive or indirectly by making critical, hurtful comments to others. Their abusive behavior pushes other people away, so they also have problems with relationships.

Better communication skills can help everyone form and maintain healthy relationships. Chapter 3 includes a detailed discussion of anger and its impact on health and relationships. Chapter 4 discusses strategies for building healthy relationships, including positive communication techniques.

Exercise

Exercise helps maintain a healthy body and mind and even stimulates the birth of new brain cells. Regular physical activity can also reduce many of the negative effects of stress. Consider the following examples:

- Taking a long walk can help decrease anxiety and blood pressure.
- A brisk 10-minute walk can leave you feeling more relaxed and energetic for up to two hours.
- People who exercise regularly react with milder physical stress responses before, during, and after exposure to stressors.
- In a study, people who took three brisk 45-minute walks each week for three months reported fewer daily hassles and an increased sense of wellness.

These findings should not be surprising because the stress response mobilizes energy resources and readies the body for physical emergencies. If you experience stress and do not physically exert yourself, you are not completing the energy cycle. You may not be able to exercise while your daily stressors occur—during class, for example, or while sitting in a traffic jam—but you can be active at other times of the day. Physical activity allows you to expend the nervous energy you have built up and trains your body to more readily achieve homeostasis following stressful situations.

It isn't hard to incorporate light to moderate exercise into your day. The important thing is to find an activity that you enjoy so it can become a habit and a regular stress reducer.

QUICK

STATS

Physically active people are 25–30% less likely to feel distressed than inactive people.

—U.S. Dept. of Health and Human Services, Physical Activity Guidelines Advisory Committee, 2008

EMBRACING WELLNESS

Altruism: Is Doing Good Good for Your Health?



Ethics and religion have long told us that it is more blessed to give than to receive. Now scientists from many disciplines are finding empirical support for the notion that altruism—unselfish love and giving—benefits the giver at least as much as the receiver. These benefits come in the form of better psychological health, better physical health, and longer life.

What is the chain of events leading from altruism to health benefits, from volunteering to improved well-being, better health, and longer life? Scientists have proposed several mechanisms:

- **Better immune system functioning.** Altruistic love may block or reduce the stress response, which is known to suppress the immune system. A healthier immune system is more effective at fighting off infection and illness.
- **Better cardiovascular health.** The stress response also affects the cardiovascular system, increasing heart rate and raising blood pressure. Altruistic love may protect the heart and blood vessels from the damaging effects of stress.
- **Activation of the relaxation response.** Altruistic love may activate the relaxation response—the opposite of the stress response, inducing feelings of warmth, calm, and happiness.
- **Pain relief.** Altruistic love may reduce sensations of pain by inducing the release of endorphins, which are brain chemicals that block pain and produce feelings of euphoria.
- **Increase in the frequency and depth of positive emotions,** such as happiness and calmness. Positive emotions may reduce the burden of psychological and physiological stress and thereby provide benefits for health-related physiological processes.
- **Increased self-esteem** and positive beliefs about self-efficacy and self-worth.
- **Better overall mental health.** The combination of positive feelings and increased self-esteem is conducive to improved mental health. Part of the effect may come from reducing self-absorption, taking an outward focus, and shifting attention away from the individual's perceived problems.
- **Better social integration, more social support.** Volunteering provides people with meaningful social roles and a sense of purpose, as well as opportunities for social contact.
- **Improved spiritual health.** Altruism provides an avenue for putting deeply felt values into practice.

Studies show that not all giving is the same—for example, donating money does not have the same beneficial health

effects as volunteering that involves personal contact. A few simple guidelines can help you get the most out of giving:

- Choose a volunteer activity that puts you in contact with people.
- Make helping voluntary. Obligatory helping can actually increase stress levels.
- Volunteer with a group. Sharing your interests with other volunteers increases social support. Volunteering seems to have the most benefits for people who also have other close relationships and social interests.
- Know your limits. Helping that goes beyond what you can handle depletes your own resources and is detrimental to your health.



SOURCES: Sternberg, E. M. 2001. Approaches to defining mechanisms by which altruistic love affects health. Research Topic White Paper #3, Institute for Research on Unlimited Love, Altruism, Compassion, Service (<http://www.altruists.org/f72>); Pembroke, G. 2007. Compassion Rx: The many health benefits of altruism (<http://epages.wordpress.com/2007/10/26/compassion-rx-the-many-health-benefits-of-altruism>).

connect[™]
ACTIVITY
DO IT ONLINE



Exercise—even light activity—can be an effective antidote to stress.

Nutrition

A healthful diet gives you an energy bank to draw from whenever you experience stress. Eating wisely also can enhance your feelings of self-control and self-esteem. Learning the principles of sound nutrition is easy, and sensible eating habits rapidly become second nature when practiced regularly. (For information about nutrition and healthy eating habits, see Chapter 12.)

For the purposes of managing stress, you may find it especially helpful to limit or avoid caffeine. Although one or two cups of coffee a day probably won't hurt you, caffeine is a mildly addictive stimulant that leaves some people jittery, irritable, and unable to sleep. Consuming caffeine during stressful situations can raise blood pressure and increase levels of cortisol.

While your diet has an effect on the way your body handles stress, the reverse is also true. Excess stress can negatively affect the way you eat. Many people, for example, respond to stress by overeating; other people skip meals or stop eating altogether during stressful periods. Both responses are not only ineffective (they don't address the causes of stress) but potentially unhealthy.

Most adults need seven to nine hours of sleep every night to stay healthy and perform their best.

Sleep

Most adults need seven to nine hours of sleep every night to stay healthy and perform their best. Getting enough sleep isn't just good for you physically. Adequate sleep also improves mood, fosters feelings of competence and self-worth, enhances mental functioning, and supports emotional functioning.

How Sleep Works Sleep occurs in two phases: **rapid eye movement (REM) sleep** and **non-rapid eye movement (NREM) sleep**. A sleeper goes through several cycles of non-REM and REM sleep each night.

NREM sleep actually includes four stages of successively deeper sleep. As you move through these stages of sleep, a variety of physiological changes occur:

- Blood pressure drops.
- Respiration and heart rates slow.
- Body temperature declines.
- Growth hormone is released.
- Brain wave patterns become slow and even.

During REM sleep, dreams occur. REM sleep is characterized by the rapid movement of the eyes under closed eyelids. Heart rate, blood pressure, and breathing rate rise, and brain activity increases to levels equal to or greater than those during waking hours. Muscles in the limbs relax completely, resulting in a temporary paralysis. (This total relaxation may prevent you from acting out your dreams while you're asleep.)

Sleep and Stress Stress hormone levels in the bloodstream vary throughout the day and are related to sleep patterns. Peak concentrations occur in the early morning, followed by a slow decline during the day and evening. Concentrations return to peak levels during the final stages of sleep and in the early morning hours. Stress hormone levels are low during non-REM sleep and increase during REM sleep. With each successive sleep cycle during the night, REM sleep lasts a little longer. This increase in REM sleep duration with each sleep cycle may underlie the progressive increase in circulating stress hormones during the final stages of sleep.

Even though stress hormones are released during sleep, it is the *lack* of sleep that has the greatest impact on stress. In someone who is suffering from **sleep deprivation** (not getting enough sleep over time), mental and physical processes

rapid eye movement (REM) sleep The portion of the sleep cycle during which dreaming occurs.

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non-rapid eye movement (non-REM) sleep The portion of the sleep cycle that involves deep sleep; non-REM sleep includes four states of successively deeper sleep.

sleep deprivation A lack of sleep over a period of time.

TAKE CHARGE Overcoming Insomnia



Most people can overcome insomnia by discovering the cause of poor sleep and taking steps to remedy it. If your insomnia lasts more than six months and interferes with daytime functioning, you should probably talk to a sleep specialist in a medical center. Sleeping pills are not recommended for chronic insomnia because they can be habit-forming; they also lose their effectiveness over time.

If you're bothered by insomnia, try the following:

- Determine how much sleep you need to feel refreshed the next day, and don't sleep longer than that.
- Go to bed at the same time every night and, more important, get up at the same time every morning, seven days a week, regardless of how much sleep you got. Don't nap during the day if you can help it. If you fall asleep in the afternoon, make the nap short—less than 30 minutes.
- Exercise every day, but not too close to bedtime. Your metabolism takes up to six hours to slow down after exercise.
- Avoid caffeine late in the day and alcohol before bedtime (it causes disturbed, fragmented sleep). If you take any medications (prescription or not), ask your doctor or pharmacist if they are known to interfere with sleep.
- Do what you can to make your sleeping environment quiet, dark, and a comfortable temperature. Overhearing music or talking can make it hard to sleep.
- Have a light snack before bedtime; you'll sleep better if you're not hungry.
- Use your bed only for sleep. Don't eat, read, study, or watch television in bed.
- Relax before bedtime with a bath, a book, music, or relaxation exercises.
- If you don't fall asleep in 15–20 minutes, or if you wake up and can't fall asleep again, get out of bed, leave the room if possible, and do something monotonous until you feel sleepy. Try distracting yourself with imagery; imagine yourself on a pleasant vacation or enjoying some beautiful scenery. Don't turn on bright lights or watch TV.
- If sleep problems persist, ask your physician for a referral to a sleep specialist in your area. You may be a candidate for a sleep study—an overnight evaluation of your sleep pattern that can uncover many sleep-related disorders.

steadily deteriorate. A sleep-deprived person experiences headaches, feels irritable, is unable to concentrate, and is more prone to forgetfulness. Poor-quality sleep has long been associated with stress and depression. A small 2008 study of female college students further associated sleep deprivation with an increased risk of suicide.

Acute sleep deprivation slows the daytime decline in stress hormones, so evening levels are higher than normal. A decrease in total sleep time also causes an increase in the level of stress hormones. Together these changes may cause an increase in stress hormone levels throughout the day and may contribute to physical and mental exhaustion. Extreme sleep deprivation can lead to hallucinations and other psychotic symptoms, as well as to a significant increase in heart attack risk.

Sleep Problems According to the National Sleep Foundation's 2011 Sleep in America Poll, 14% of American adults sleep an average of less than six hours per night. (Compare this to the recommended seven to nine hours per night.) Although many of us can attribute the lack of sleep to long workdays and family responsibilities, as many as 70 million Americans suffer from chronic sleep disorders—medical conditions that prevent them from sleeping well.

According to National Sleep Foundation polls, more than 50% of adults report having trouble falling asleep or staying asleep—a condition called **insomnia**. The most common causes of insomnia are lifestyle factors, such as high caffeine

or alcohol intake before bedtime; medical problems, such as a breathing disorder; and stress. About 75% of people who suffer from chronic insomnia report some stressful life event at the onset of their sleeping problems. (For more information, see the box “Overcoming Insomnia.”)

Another type of chronic sleep problem, called **sleep apnea**, occurs when a person stops breathing while asleep. Apnea can be caused by a number of factors, but it typically results when the soft tissue at the back of the mouth (such as the tongue or soft palate) “collapses” during sleep, blocking the airway (Figure 2.4). When breathing is interrupted, so is sleep, because the sleeper awakens repeatedly throughout the night to begin breathing again. In most cases, this occurs without the sleeper's even being aware of it. However, the disruption to sleep can be significant, and over time acute sleep deprivation can result from apnea. There are several treatments for apnea, including the use of medications, a special apparatus that helps keep the airway open during sleep, and surgery.

insomnia A sleep problem involving the inability to fall or stay asleep.

sleep apnea The interruption of normal breathing during sleep.

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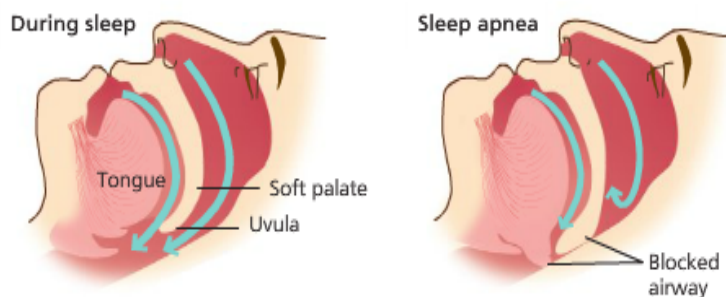


FIGURE 2.4 Sleep apnea. Sleep apnea occurs when soft tissues surrounding the airway relax, “collapsing” the airway and restricting airflow.

Time Management

Learning to manage your time can be crucial to coping with everyday stressors. Overcommitment, procrastination, and even boredom are significant stressors for many people. Along with gaining control of nutrition and exercise to maintain a healthy energy balance, time management is an important element in a wellness program. Try these strategies for improving your time management skills:

- **Set priorities.** Divide your tasks into three groups: essential, important, and trivial. Focus on the first two, and ignore the third.
- **Schedule tasks for peak efficiency.** You’ve probably noticed you’re most productive at certain times of the day (or night). Schedule as many of your tasks for those hours as you can, and stick to your schedule.
- **Set realistic goals and write them down.** Attainable goals spur you on. Impossible goals, by definition, cause frustration and failure. Fully commit yourself to achieving your goals by putting them in writing. (See Chapter 1 for more information about goal setting.)
- **Budget enough time.** For each project you undertake, calculate how long it will take to complete. Then tack on another 10–15%, or even 25%, as a buffer.
- **Break up long-term goals into short-term ones.** Instead of waiting for large blocks of time, use short amounts of time to start a project or keep it moving.
- **Visualize the achievement of your goals.** By mentally rehearsing your performance of a task, you will be able to reach your goal more smoothly.
- **Keep track of the tasks you put off.** Analyze why you procrastinate. If the task is difficult or unpleasant, look for ways to make it easier or more fun.
- **Consider doing your least favorite tasks first.** Once you have the most unpleasant ones out of the way, you can work on the tasks you enjoy more.
- **Consolidate tasks when possible.** For example, try walking to the store so that you run your errands and exercise in the same block of time.

- **Identify quick transitional tasks.** Keep a list of 5- to 10-minute tasks you can do while waiting or between other tasks, such as watering your plants, doing the dishes, or checking a homework assignment.

- **Delegate responsibility.** Asking for help when you have too much to do is no cop-out; it’s good time management. Just don’t delegate the jobs you know you should do yourself.

- **Say no when necessary.** If the demands made on you don’t seem reasonable, say no—tactfully, but without guilt or apology.

- **Give yourself a break.** Allow time for play—free, unstructured time when you can ignore the clock. Don’t consider this a waste of time. Play renews you and enables you to work more efficiently.

- **Avoid your personal “time sinks.”** You can probably identify your own time sinks—activities like watching television, surfing the Internet, or talking on the phone that consistently use up more time than you anticipate and put you behind schedule. Some days, it may be best to avoid problematic activities altogether; for example, if you have a big paper due, don’t sit down for a five-minute TV break if that’s likely to turn into a two-hour break. Try a five-minute walk if you need to clear your head.



Managing the many commitments of adult life—including work, school, and parenthood—can sometimes feel overwhelming and produce a great deal of stress. Time management and problem-solving skills, including careful scheduling with a date book or handheld computer, can help people cope with busy days.

- *Stop thinking or talking about what you're going to do, and just do it!* Sometimes the best solution for procrastination is to stop waiting for the right moment and just get started. You will probably find that things are not as bad as you feared, and your momentum will keep you going.

Striving for Spiritual Wellness

Spiritual wellness is associated with greater coping skills and higher levels of overall wellness. It is a very personal wellness component, and there are many ways to develop it. Researchers have linked spiritual wellness to longer life expectancy, reduced risk of disease, faster recovery, and improved emotional health. Although spirituality is difficult to study, and researchers aren't sure how or why spirituality seems to improve health, several explanations have been offered:

- **Social support.** Attending religious services or participating in volunteer organizations helps people feel that they are part of a community with similar values and promotes social connectedness and caring.
- **Healthy habits.** Some of the paths to spiritual wellness may encourage healthy behaviors, such as eating a vegetarian diet or consuming less meat and alcohol, and may discourage harmful habits like smoking.
- **Positive attitude.** Spirituality can give a person a sense of meaning and purpose in life, and these qualities create a more positive attitude in the person, which in turn helps her or him cope with life's challenges.
- **Moments of relaxation.** Spiritual practices such as prayer, meditation, and immersion in artistic activities can reduce stress by eliciting the relaxation response.

Spiritual wellness does not require participation in organized religion. Many people find meaning and purpose in other ways. By spending time in nature or working on environmental issues, people can experience continuity with the natural world. Spiritual wellness can come through helping others in one's community or by promoting human rights, peace and harmony among people, and opportunities for human development on a global level. Other people develop spiritual wellness through art or through their personal relationships.

Spirituality provides an ethical path to personal fulfillment that includes connectedness with self, others, and a higher power or larger reality. Spiritual wellness can make you more aware of your personal values and can help clarify them. Without an awareness of personal values, you might be driven by immediate desires and the passing demands of others. Living according to values means considering your options carefully before making a choice, choosing between options without succumbing to outside pressures that oppose your values, and making a choice and acting on it rather than doing nothing.

Confiding in Yourself through Writing

Keeping a diary is analogous to confiding in others, except that you are confiding in yourself. This form of coping with severe stress may be especially helpful for those who are shy or introverted and find it difficult to open up to others. Although writing about traumatic and stressful events may have a short-term negative effect on mood, over the long term, stress is reduced and positive changes in health occur. A key to promoting health and well-being through journaling is to write about your emotional responses to stressful events. Set aside a special time each day or week to write down your feelings about stressful events in your life.

Cognitive Techniques

Some stressors arise in our own minds. Ideas, beliefs, perceptions, and patterns of thinking can add to our stress level. Each of the following techniques can help you change unhealthy thought patterns to ones that will help you cope with stress. As with any skill, mastering these techniques takes practice and patience.

Think and Act Constructively Think back to the worries you had last week. How many of them were needless? Think about things you *can* control. Try to stand aside from the problem, consider the positive steps you can take to solve it, and then carry them out. Remember, if you can successfully predict that a stressor will occur, you can better control your response to it. In the evening, try to predict stressful events you might encounter the following day. Then decide how to handle them constructively. This may mean dealing positively with an unpleasant person or figuring out how to stay focused during a boring class. By taking a constructive approach, you can prevent stressors from becoming negative events and perhaps even turn them into positive experiences.

Take Control A situation often feels more stressful if you feel you're not in control of it. Time may seem to be slipping away before a big exam, for example. Unexpected obstacles may appear in your path, throwing you off course. When you feel your environment is controlling you instead of the other way around, take charge! Concentrate on what is possible to control, and set realistic goals. Be confident of your ability to succeed.

Problem-Solve Students with greater problem-solving abilities report easier adjustment to university life, higher motivation levels, lower stress levels, and higher grades. When you find yourself stewing over a problem, sit down with a piece of paper and do some problem solving. Try this approach:

1. Define the problem in one or two sentences.
2. Identify the causes of the problem.
3. Consider alternative solutions. Don't just stop with the most obvious one.

4. Weigh positive and negative consequences for each alternative.
5. Make a decision—choose a solution.
6. Make a list of tasks you must perform to act on your decision.
7. Begin to carry out the tasks on your list.
8. Evaluate the outcome and revise your approach if necessary.

Modify Your Expectations Expectations are exhausting and restricting. The fewer expectations you have, the more you can live spontaneously and joyfully. The more you expect from others, the more often you will feel let down. And trying to meet the expectations others have of you is often futile.

Stay Positive If you beat up on yourself—“Late for class again! You can’t even cope with college! How do you expect to ever hold down a real job?”—try changing your inner dialogue. Talk to yourself as you would to a child you love: “You’re a smart, capable person. You’ve solved other problems; you’ll handle this one. Tomorrow you’ll simply schedule things so you get to class with a few minutes to spare.” (Chapter 3 has more information about self-talk.)

Practice Affirmations One way of cultivating the positive is to systematically repeat positive thoughts, or *affirmations*, to yourself. For example, if you react to stress with low self-esteem, you might repeat sentences such as “I approve and accept myself completely” and “It matters not what others say, but what I believe.” Saying affirmations to yourself every day may make them automatic and help you change the way you react.

Cultivate Your Sense of Humor When it comes to stress, laughter may be the best medicine. Even a fleeting smile produces changes in your autonomic nervous system that can lift your spirits. And a few minutes of belly laughing can be as invigorating as brisk exercise. Hearty laughter elevates your heart rate, aids digestion, eases pain, and triggers the release of endorphins and other pleasurable and stimulating chemicals in the brain. After a good laugh, your muscles go slack; your pulse and blood pressure dip below normal. You are relaxed. Cultivate the ability to laugh at yourself, and you’ll have a handy and instantly effective stress reliever.

Focus on What’s Important A major source of stress is trying to store too much data. Forget unimportant details (they will usually be self-evident) and organize important information. One technique you can try is to “chunk” important material into categories. If your next exam covers three chapters from your textbook, consider each chapter a chunk

of information. Then break down each chunk into its three or four most important features. Create a mental outline that allows you to trace your way from the most general category down to the most specific details. This technique can be applied to managing daily responsibilities as well.

Relaxation Techniques

The **relaxation response** is a physiological state characterized by a feeling of warmth and quiet mental alertness. This is the opposite of the fight-or-flight reaction. When you call upon a relaxation technique to trigger the relaxation response, your heart rate, breathing, and metabolism slow down, and your blood pressure and oxygen consumption decrease. At the same time, blood flow to the brain and skin increases, and brain waves shift from an alert beta rhythm to a relaxed alpha rhythm. Practiced regularly, relaxation techniques can counteract the debilitating effects of stress.

If you decide to try a relaxation technique, practice it daily until it becomes natural to you, and then use it whenever you feel the need. You may feel calmer and more refreshed after each session. You’ll know you’ve mastered a deep relaxation technique when you start to see subtle changes in other areas of your life: You may notice you’ve been encountering fewer hassles, working more efficiently, or enjoying more free time. None of the techniques takes long to do.

Progressive Relaxation Unlike most of the other methods of relaxation, progressive relaxation requires no imagination, willpower, or self-suggestion. You simply tense and relax the muscles in your body, group by group. The technique, also known as deep muscle relaxation, helps you become aware of the muscle tension that occurs when you’re under stress. When you consciously relax those muscles, other systems of the body get the message and ease up on the stress response.

Start, for example, with your right fist. Inhale as you tense it. Exhale as you relax it. Repeat. Next, contract and relax your right upper arm. Repeat. Do the same with your left arm. Then, beginning at your forehead and ending at your feet, contract and relax your other muscle groups. Repeat each contraction at least once, breathing in as you tense, breathing out as you relax. To speed up the process, tense and relax more muscles at one time—both arms simultaneously, for instance. With practice, you’ll be able to relax very quickly and effectively by clenching and releasing only your fists.

relaxation response A physiological state characterized by a feeling of warmth and quiet mental alertness.

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TAKE CHARGE

Meditation and the Relaxation Response



Here is a simple technique for eliciting the relaxation response.

The Basic Technique

1. Pick a word, phrase, or object to focus on. If you like, you can choose a word or phrase that has a deep meaning for you, but any word or phrase will work. Some meditators prefer to focus on their breathing.
2. Take a comfortable position in a quiet environment, and close your eyes if you aren't focusing on an object.
3. Relax your muscles.
4. Breathe slowly and naturally. If you're using a focus word or phrase, silently repeat it each time you exhale. If you're using an object, focus on it as you breathe.
5. Keep a passive attitude. Disregard thoughts that drift in.
6. Continue for 10–20 minutes, once or twice a day.
7. When you're finished, sit quietly for a few minutes with your eyes first closed and then open. Then stand up.

Suggestions

- Allow relaxation to occur at its own pace; don't try to force it. Don't be surprised if you can't quiet your mind for more than a few seconds at a time; it's not a reason for anger or frustration. The more you ignore the intrusions, the easier doing so will become.
- If you want to time your session, peek at a watch or clock occasionally, but don't set a jarring alarm.
- The technique works best on an empty stomach, before a meal or about two hours after eating. Avoid times of day when you're tired—unless you want to fall asleep.
- Although you'll feel refreshed even after the first session, it may take a month or more to get noticeable results. Be patient. Eventually the relaxation response will become so natural that it will occur spontaneously, or on demand, when you sit quietly for a few moments.

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ACTIVITY
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Visualization Also known as *imagery*, **visualization** lets you daydream without guilt. Athletes find that the technique enhances sports performance, and visualization is even part of the curriculum at U.S. Olympic training camps. You can use visualization to help you relax, change your habits, or perform well—whether on an exam, a stage, or a playing field.

Next time you feel stressed, close your eyes. Imagine yourself floating on a cloud, sitting on a mountaintop, or lying in a meadow. Involve all your senses; imagine the sounds, the smells, and the other sensations that would be part of the scene. Your body will respond as if the imagery were real. An alternative: Close your eyes and imagine a deep purple light filling your body. Now change the color into a soothing gold. As the color lightens, so should your distress.

You can also use visualization to rehearse for an upcoming event and enhance performance. By experiencing an event ahead of time in your mind, you can practice coping with any difficulties that may arise. Think positively, and you can “psych yourself up” for a successful experience.

Meditation The need to periodically stop our incessant mental chatter is so great that, from ancient times, hundreds of forms of **meditation** have developed in cultures all over the world. Meditation is a way of telling the mind to be quiet for a while. Because meditation has been at the core of many Eastern religions and philosophies, it has acquired an “Eastern” mystique that causes some people to shy away from it. Yet meditation requires no special knowledge or background. Whatever philosophical, religious, or emotional reasons may be given for meditation, it is potentially useful for reducing stress. According to a 2008 study, college students who

learned how to use meditation for stress management were able to significantly reduce their daily stress levels. Further, those students found it easier to forgive others for perceived wrongdoings and spent less time focusing on negative thoughts.

Meditation helps you tune out the world temporarily, removing you from both internal and external sources of stress. The “thinker” takes time out to become the “observer”—calmly attentive, without analyzing, judging, comparing, or rationalizing. Regular practice of this quiet awareness will subtly carry over into your daily life, encouraging physical and emotional balance no matter what confronts you. For a step-by-step description of a basic meditation technique, see the box “Meditation and the Relaxation Response.”

Another form of meditation, known as *mindfulness meditation*, involves paying attention to physical sensations, perceptions, thoughts, and imagery. Instead of focusing on a word or object to quiet the mind, you observe thoughts that occur without evaluating or judging them. Development of this ability requires regular practice but may eventually result in a more objective view of one's perceptions. It is believed that a

visualization A technique for promoting relaxation or improving performance that involves creating or re-creating vivid mental pictures of a place or an experience; also called *imagery*.

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meditation A technique for quieting the mind by focusing on a particular word, object (such as a candle flame), or process (such as breathing).

greater understanding of one's moment-to-moment thought processes (mindful awareness) provides a richer and more vital sense of life and improves coping. Studies also suggest that people who rate high in mindfulness are less anxious and better able to deal with stress; among people with specific health problems, mindfulness can provide substantial benefits.

Deep Breathing Your breathing pattern is closely tied to your stress level. Deep, slow breathing is associated with relaxation. Rapid, shallow, often irregular breathing occurs during the stress response. With practice, you can learn to slow and quiet your breathing pattern, thereby also quieting your mind and relaxing your body. Breathing techniques can be used for on-the-spot tension relief as well as for long-term stress reduction.

The primary goal of many breathing exercises is to change your breathing pattern from chest breathing to diaphragmatic ("belly") breathing. (The diaphragm is a sheet of muscle and connective tissue that divides the chest and abdominal cavities.) Except when sleeping, most adults breathe by expanding their chest and raising their shoulders rather than by expanding their abdomen. Diaphragmatic breathing is slower and deeper than chest breathing. To practice diaphragmatic breathing, lie on your back and place one hand on your chest and one hand on your abdomen to monitor your breathing. Take a slow, deep breath through your nose and into your belly. Your abdomen should rise significantly and your chest only slightly. Think of filling your belly with air. Exhale gently through your mouth. Once you become familiar with belly breathing, you can use it anywhere, any time, to dispel tension and stress.

Yoga Hatha yoga, the most common yoga style practiced in the United States, emphasizes physical balance and breath control. It integrates components of flexibility, muscular strength and endurance, and muscle relaxation; it also sometimes serves as a preliminary to meditation. A session of yoga typically involves a series of postures, each held for a few seconds to several minutes, which involve stretching and balance and coordinated breathing. Yoga can induce the relaxation response and promote body awareness and flexibility. If you are interested in trying yoga, it's best to take a class from an experienced instructor.

Tai Chi This martial art (in Chinese, *taijiquan*) is a system of self-defense that incorporates philosophical concepts from Taoism and Confucianism. In addition to self-defense, tai chi aims to bring the body into balance and harmony to promote health and spiritual growth. It teaches practitioners to remain calm and centered, to conserve and concentrate energy, and to manipulate force by becoming part of it—by "going with the flow." Tai chi is considered the gentlest of the martial arts. Instead of quick and powerful movements, tai chi consists of a series of slow, fluid, elegant movements, which reinforce the idea of moving *with* rather than *against* the stressors of every-



Listening to soothing music leads to reduced levels of stress hormones and can induce the relaxation response.

day life. As with yoga, it's best to start tai chi with a class led by an experienced instructor.

Listening to Music Listening to music is another method of inducing relaxation. It can influence pulse, blood pressure, and the electrical activity of muscles. Studies of newborns and hospitalized stroke patients have shown that listening to soothing, lyrical music can lessen depression, anxiety, and stress levels. Researchers have found that exposure to soothing music leads to reduced levels of the stress hormone cortisol and causes changes in the electrical activity in the brain.

To experience the stress management benefits of music yourself, set aside a time to listen. Choose music that you enjoy and that makes you feel relaxed.

Biofeedback Biofeedback helps people reduce the stress response by enabling them to become more aware of their level of physiological arousal. It involves electrical monitoring

QUICK

STATS

1 in 10 Americans practices yoga in one form or another.

—Yoga Business Academy, 2011

biofeedback A technique in which monitoring devices help a person become conscious of unconscious body processes, such as body temperature or blood pressure, in order to exert some control over them.

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of some measure of the physiological stress response, such as perspiration, heart rate, skin temperature, or muscle tension. The subject receives feedback about his or her condition through the use of sound (a tone or music), light, or a meter or dial. For example, as heart rate increases, the tone becomes louder; as it decreases, the tone becomes softer. In this way, people can learn to reduce their physiological stress response through conscious control even without biofeedback.

The point of biofeedback training is to learn how relaxation feels, how to induce relaxation, and how to transfer this skill to daily life (without the use of electronic equipment). In addition to monitoring equipment, biofeedback usually also requires the initial help of a therapist, stress counselor, or technician.

Counterproductive Coping Strategies

College is a time when you'll learn to adapt to new and challenging situations and gain skills that will last a lifetime. It is also a time when many people develop counterproductive and unhealthy habits in response to stress. Such habits can last well beyond graduation.

Tobacco Use Many young adults who never smoked in high school smoke their first cigarette in college, usually at a party or bar or in a dorm with friends. Many smokers report that smoking helps them to cope with stress by providing a feeling of relaxation, giving them something to do with their hands in social situations, or breaking up monotony and routine.

Cigarettes and other tobacco products contain *nicotine*, a chemical that enhances the actions of neurotransmitters. Nicotine can make you feel relaxed and even increase your ability to concentrate, but it is highly addictive. In fact, nicotine dependence itself is considered a psychological disorder. Cigarette smoke also contains substances that cause heart disease, stroke, lung cancer, and emphysema. These negative consequences far outweigh any beneficial effects, and tobacco use should be avoided. The easiest thing to do is to not start.

See Chapter 11 for more about the health effects of tobacco use and for tips on how to quit.

Use of Alcohol and Other Drugs No college experience is complete without an occasional party. Letting loose, dancing, laughing, and interacting with others—all are part of college parties and all can be effective short-term coping strategies. However, partying in college is usually associated with drinking alcohol. Keg parties and drinking games can be fun, but they contribute to binge drinking and other forms of alcohol abuse. Like nicotine, alcohol is addictive, and many alcoholics find it hard to relax without a drink. Having a few drinks might make you feel temporarily at ease, and drinking until you're intoxicated may help you forget your current stressors. However, using alcohol to deal with stress places you at risk for all the short- and long-term problems associated with

QUICK STATS

41% of college-age Americans binge-drink.

—National Survey on Drug Use and Health, 2010

alcohol abuse. It also does nothing to address the actual causes of stress in your life. Although limited alcohol consumption may have potential health benefits for some people, many college students have patterns of drinking that detract from wellness. For more about the responsible use of alcohol, refer to Chapter 10.

Using other psychoactive drugs to cope with stress is also usually counterproductive:

- Caffeine raises cortisol levels and blood pressure and can make you feel more stressed; caffeine also disrupts sleep. Other stimulants, such as amphetamines, can activate the stress response. They also affect the same areas of the brain that are involved in regulating the stress response.
- Use of marijuana causes a brief period of euphoria and decreased short-term memory and attentional abilities. Physiological effects clearly show that marijuana use doesn't cause relaxation; in fact, some neurochemicals in marijuana act to enhance the stress response, and getting high on a regular basis can elicit panic attacks. To compound this, withdrawal from marijuana may also be associated with an increase in circulating stress hormones.
- Opioids such as morphine and heroin can mimic the effects of your body's natural painkillers and act to reduce anxiety. However, tolerance to opioids develops quickly, and many users become dependent.

For more information about the use of psychoactive drugs, see Chapter 9.

Unhealthy Eating Habits The nutrients in the food you eat provide energy and the substances needed to maintain your body. Eating is also psychologically rewarding. The feelings of satiation and sedation that follow eating produce a relaxed state. However, regular use of eating as a means of coping with stress may lead to unhealthy eating habits. In fact, a survey by the American Psychological Association revealed that about 25% of Americans use food as a means of coping with stress or anxiety. These "comfort eaters" are twice as likely to be obese as average Americans.

Certain foods and supplements are sometimes thought to fight stress. Carbohydrates may reduce the stress response by promoting activity of the parasympathetic nervous system; however, a high-carbohydrate diet can lead to weight gain in sedentary people and is not recommended as a strategy for coping with stressors. In addition, some evidence suggests that greater ingestion of carbohydrates, simple sugars, and fatty foods may actually be a predisposing factor for psychological distress. Many dietary supplements are marketed for stress reduction, but supplements are not required to meet the same standards as medications in terms of safety, effectiveness, and manufacturing (see Chapters 12 and 20).

CREATING A PERSONAL PLAN FOR MANAGING STRESS

What are the most important sources of stress in your life? Are you coping successfully with these stressors? No single strategy or program for managing stress will work for everyone, but you can use the principles of behavior management described in Chapter 1 to tailor a plan specifically to your needs. The most important starting point for a successful stress management plan is to learn to listen to your body. When you learn to recognize the stress response and the emotions and thoughts that accompany it, you'll be in a position to take charge of that crucial moment and handle it in a healthy way.

Identifying Stressors

Before you can learn to manage the stressors in your life, you have to identify them. Many experts recommend keeping a stress journal for a week or two (see Figure 2.5). Each time you feel or express a stress response, record the time and the circumstances in your journal. Note what you were doing at the time, what you were thinking or feeling, and the outcome of your response.

After keeping your journal for a few weeks, you should be able to identify your key stressors and spot patterns in how you respond to them. Take note of the people,

The most important starting point for a successful stress management plan is to learn to listen to your body.

places, events, and patterns of thought and behavior that cause you the most stress. You may notice, for example, that mornings are usually the most stressful part of your day. Or you may discover that when you're angry at your roommate, you're apt to respond with behaviors that only make matters worse. Keeping a journal allows you to analyze what produces the most stress in your life and fills in where your conscious memory fails you.

Designing Your Plan

Once you have identified the key stressors in your life, choose the stress reduction techniques that will work best for you and create an action plan for change. Finding a buddy to work with you can make the process more fun and increase your chances of success. Some experts recommend drawing up a formal

contract with yourself.

Whether or not you complete a contract, it's important to design rewards into your plan. You might treat yourself to a special breakfast in a favorite restaurant on the weekend (as long as you eat a nutritious breakfast every weekday morning). It's also important to evaluate your plan regularly and redesign it as your needs change. Under times of increased stress, for example, you might want to focus on good eating, exercise, and relaxation habits. Over time, your new stress management skills will become almost automatic. You'll feel better, accomplish more, and reduce your risk of disease.

STRESS JOURNAL		DATE <u>1-21-13</u>
TIME	STRESSOR	REACTION/ COPING STRATEGY
7:45 AM	Tara wouldn't get out of the shower	Yelled at her, started an argument
8:35 AM	Late for class	Flouched in back of room; chewed my nails
11:55 AM	Dad called to discuss credit card debt	Cried, skipped lunch and went out to smoke with Greg
5:30 PM	Power outage at dorm, couldn't study	Took a walk with Tara, made up for arguing this morning, then went to library to study
7:45 PM	Ed called, asked to borrow money	Played calm, put down phone and counted to 10, then explained that he already owes me \$50.
8:30 PM	Ed called, angry, said he wanted to break up	Argued on phone, then went out with Tara for a drink

FIGURE 2.5 A sample stress journal. Tracking stressful events and reactions can help you understand how you normally cope with stress.

Getting Help

If the techniques discussed so far don't provide you with enough relief from the stress in your life, you might want to learn more about specific areas to work on. Excellent self-help guides can be found in bookstores or the library. Additional resources are listed in the "For More Information" section at the end of the chapter.

Your student health center or student affairs office can tell you whether your campus has a peer counseling program. Such programs are usually staffed by volunteer students with special training that emphasizes maintaining confidentiality. Peer counselors can guide you to other campus or community resources or can simply provide understanding.

Support groups are typically organized around a particular issue or problem. In your area, you might find a support group for first-year students; for reentering students; for single parents; for students of your ethnicity, religion, or national origin; for people with eating disorders; or for rape survivors. The number of such groups has increased in recent years as more and more people discover how therapeutic it can be to talk with others who share the same situation.

Short-term psychotherapy can also be tremendously helpful in dealing with stress-related problems. Your student

health center may offer psychotherapy on a sliding-fee scale; the county mental health center in your area may do the same. If you belong to any type of religious organization, check to see whether pastoral counseling is available. Your physician can refer you to psychotherapists in your community. Not all therapists are right for all people, so be prepared to have initial sessions with several. Choose the one you feel most comfortable with.

connect™

Connect to Your Choices

Have you ever thought about why you handle stress the way you do? Many factors can influence the choices we make about stress management—some not as obvious as others. Do you try to do too much and then take your frustration out on other people because that's how stress was handled in your family? Do you blow off steam with alcohol on weekends because that's what your friends are doing? Do you dismiss relaxation techniques like yoga, meditation, or deep breathing because you think they're only for a certain type of person?

What are the external factors that influence your choices about stress management? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

For the stress you can't avoid, develop a range of stress management techniques and strategies.

RIGHT NOW YOU CAN:

- Practice deep breathing for 5–10 minutes.
- Visualize a relaxing, peaceful place and imagine yourself experiencing it as vividly as possible. Stay there as long as you can.
- Do some stretching exercises.
- Get out your datebook and schedule what you'll be doing the rest of today and tomorrow. Pencil in a short walk and a conversation with a friend.

IN THE FUTURE YOU CAN:

- Take a class or workshop that can help you overcome a source of stress, such as one in assertiveness training or time management.
- Find a way to build relaxing time into every day. Just 15 minutes of meditation, stretching, or massage can induce the relaxation response.

SUMMARY

- When confronted with a stressor, the body undergoes a set of physical changes known as the fight-or-flight reaction. The sympathetic nervous system and endocrine system act on many targets in the body to prepare it for action.
- Emotional and behavioral responses to stressors vary among individuals. Ineffective responses increase stress but can be moderated or changed.
- Factors that influence emotional and behavioral responses to stressors include personality, cultural background, gender, and past experiences.
- The general adaptation syndrome (GAS) has three stages: alarm, resistance, and exhaustion.
- A high allostatic load characterized by prolonged or repeated exposure to stress hormones can increase a person's risk of health problems.
- Psychoneuroimmunology (PNI) looks at how the physiological changes of the stress response affect the immune system and thereby increase the risk of illness.
- Health problems linked to stress include cardiovascular disease, colds and other infections, asthma and allergies, cancer, flare-ups of chronic diseases, psychological problems, digestive problems, headaches, insomnia, and injuries.
- A cluster of major life events that require adjustment and accommodation can lead to increased stress and an increased risk of health problems. Minor daily hassles increase stress if they are perceived negatively.
- Sources of stress associated with college may be academic, interpersonal, time-related, or financial pressures.
- Job-related stress is common, particularly for employees who have little control over decisions relating to their jobs. If stress is severe or prolonged, burnout may occur.
- New and changing relationships, prejudice, and discrimination are examples of interpersonal and social stressors.
- Social support systems help buffer people against the effects of stress and make illness less likely. Good communication skills foster healthy relationships.
- Exercise, nutrition, sleep, and time management are wellness behaviors that reduce stress and increase energy.
- Cognitive techniques for managing stress involve developing new and healthy patterns of thinking, such as practicing problem solving, monitoring self-talk, and cultivating a sense of humor.
- The relaxation response is the opposite of the fight-or-flight reaction. Techniques that trigger it, including progressive relaxation, imagery, meditation, and deep breathing, counteract the effects of chronic stress. Counterproductive coping strategies include smoking, drinking, and unhealthy eating.

- A successful individualized plan for coping with stress begins with the use of a stress journal or log to identify and study stressors and inappropriate behavioral responses. Completing a contract and recruiting a buddy can help your stress management plan succeed.
- Additional help in dealing with stress is available from self-help books, peer counseling, support groups, and psychotherapy.

FOR MORE INFORMATION

BOOKS

Goelitz, J., and R. A. Rees. 2011. *The College De-Stress Handbook: Keeping Cool Under Pressure from the Inside Out*. Boulder Creek, CA: Institute of HeartMath. A brief guide to managing college stress, with tips on recognizing stressors, reducing their intensity, and learning new ways to respond.

Greenberg, J. 2010. *Comprehensive Stress Management*. 12th ed. New York: McGraw-Hill. Provides a clear explanation of the physical, psychological, sociological, and spiritual aspects of stress and offers numerous stress management techniques.

Kabat-Zinn, J. 2011. *Mindfulness for Beginners: Reclaiming the Present Moment—and Your Life*. Louisville, CO: Sounds True. A distillation of the ideas, attitudes, and practices that constitute the basics of mindfulness and mindful living.

Pennebaker, J. W. 2004. *Writing to Heal: A Guided Journal for Recovering from Trauma and Emotional Upheaval*. Oakland, CA: New Harbinger Press. Provides information about using journaling to cope with stress.

ORGANIZATIONS AND WEBSITES

American Headache Society. Provides information for consumers and clinicians about different types of headaches, their causes, and their treatment.

<http://www.americanheadachesociety.org>

American Psychological Association. Provides information about stress management and psychological disorders.

<http://www.apa.org>

<http://www.apa.org/helpcenter>

American Psychiatric Association: Healthy Minds, Healthy Lives. Provides information about mental wellness developed especially for college students.

<http://www.healthyminds.org>

Association for Applied Psychophysiology and Biofeedback. Provides information about biofeedback and referrals to certified biofeedback practitioners.

<http://www.aapb.org>

Benson-Henry Institute for Mind Body Medicine. Provides information about stress management and relaxation techniques.

<http://www.massgeneral.org/bhi>

National Institute of Mental Health (NIMH). Publishes informative brochures about stress and stress management as well as other aspects of mental health.

<http://www.nimh.nih.gov>

National Sleep Foundation. Provides information about sleep and how to overcome sleep problems such as insomnia and jet lag.

<http://www.sleepfoundation.org>

The American Institute of Stress. A resource of in-depth information on stress, its causes, and its treatments.

<http://www.stress.org>

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BEHAVIOR CHANGE STRATEGY

Dealing with Test Anxiety

Do you perform as well as you should on tests? Does anxiety interfere with your ability to study effectively before a test and to think clearly in the test situation? If so, you may be experiencing test anxiety. Two effective methods can help you deal with test anxiety: systematic desensitization and success rehearsal.

Systematic Desensitization

Systematic desensitization is based on the premise that you can't feel anxiety and be relaxed at the same time.

Phase I: Constructing an Anxiety Hierarchy Begin the first phase by thinking of 10 or more situations related to your fear, such as hearing the announcement of the test date in class, studying for the test, reading the test questions, and so on. Write each situation on an index card. On the other side, list several realistic details or prompts that will help you vividly imagine yourself actually experiencing the situation. For example, if the situation is "hearing that 50% of the final grade will be based on the two exams," the prompts might include details such as "sitting in the big lecture auditorium in Baily Hall," "taking notes in my blue notebook," and "listening to Professor Smith's voice."

Next arrange your cards in order, from least tense to most tense situation. Rate each situation on a scale of 0–100, and make sure the distances between items are fairly small and about equal. When you're sure your anxiety hierarchy is a true reflection of your feelings, number the cards.

Phase II: Learning and Practicing Muscle Relaxation The second phase of the program involves learning to relax your muscles and to recognize when they are relaxed (see the description of progressive relaxation in this chapter). As you become proficient at this technique, you'll be able to go into a deeply relaxed state within just a few minutes. When you can do this, go on to the next phase of the program.

Phase III: Implementing the Desensitization Program Use the quiet place where you practiced your relaxation exercises. Sit comfortably and take several minutes to relax completely, and then look

at the first card, reading both the brief phrase and the descriptive prompts. Close your eyes and imagine yourself in that situation for about 10 seconds. Then put the card down and relax completely for about 30 seconds. Look at the card again, imagine the situation for 10 seconds, and relax again for 30 seconds.

At this point, evaluate your current level of anxiety about the situation on the card in terms of the rating scale you devised earlier. If your anxiety level is 10 or below, relax for two minutes and go on to the second card. If it's higher than 10, repeat the routine with the same card until the anxiety decreases.

If you have difficulty with a particular item, go back to the previous item and try it again. If you still can't visualize it without anxiety, try to construct three new items with smaller steps between them and insert them before the troublesome item. You should be able to move through one to four items per session.

Sessions can be conducted from twice a day to twice a week and should last no longer than 20 minutes. It's helpful to graph your progress in a way that has meaning for you.

After you have successfully completed your program, you should be desensitized to the real-life situations that previously caused anxiety. If you find that you experience some anxiety in the real situations, take 30 seconds or a minute to relax completely, just as you did when you were practicing.

Success Rehearsal

To practice this variation on systematic desensitization, take your hierarchy of anxiety-producing situations and vividly imagine yourself successfully dealing with each one. Create a detailed scenario for each situation, and use your imagination to experience genuine feelings of confidence. Recognize your negative thoughts ("I'll be so nervous I won't be able to think straight") and replace them with positive ones ("Anxiety will keep me alert so I can do a good job").

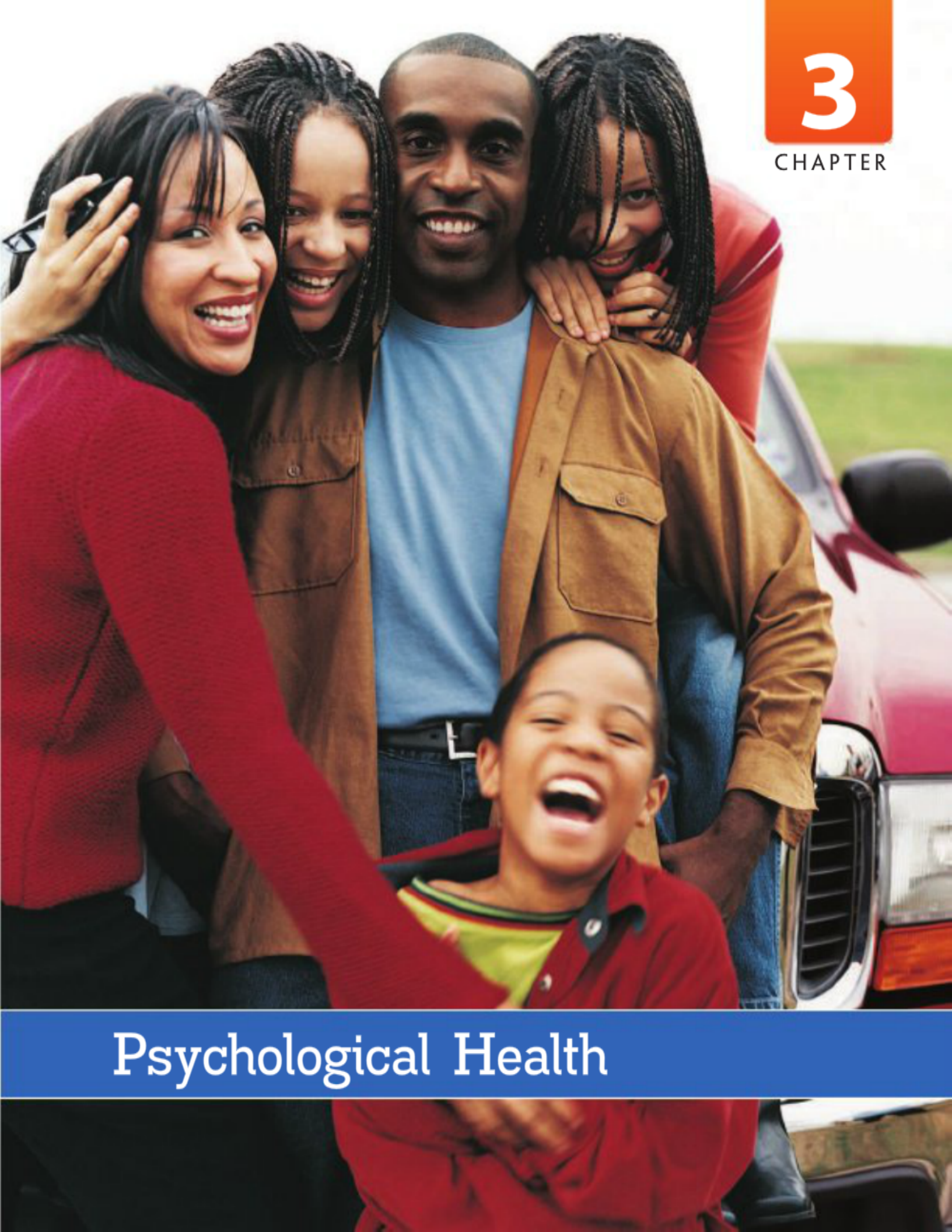
Proceed one step at a time, thinking as you go of strategies for success that you can later implement. These might include the following:



- Before the test, find out everything you can about it—its format, the material to be covered, the grading criteria. Ask the instructor for practice materials. Study in advance; don't just cram the night before. Avoid all-nighters.
- Devise a study plan. This might include forming a study group with one or more classmates or outlining what you will study, when, where, and for how long. Generate your own questions and answer them.
- In the actual test situation, sit away from possible distractions, listen carefully to instructions, and ask for clarification if you don't understand a direction.
- During the test, answer the easiest questions first. If you don't know an answer and there is no penalty for incorrect answers, guess. If there are several questions you have difficulty answering, review the ones you have already handled. Figure out approximately how much time you have to cover each question.
- For true-false questions, look for qualifiers such as *always* and *never*. Such questions are likely to be false.
- Avoid worrying about past performance, how others are doing, or the negative consequences of a poor test grade. If you start to become nervous, take some deep breaths and relax your muscles completely for a minute or so.

The best way to counter test anxiety is with successful test-taking experiences. If you find that these methods aren't sufficient to get your anxiety under control, you may want to seek professional help.

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3

CHAPTER

Psychological Health

LOOKING AHEAD...

After reading this chapter, you should be able to

- Describe what it means to be psychologically healthy
- Explain how to develop and maintain a positive self-concept and healthy self-esteem
- Discuss the importance of an optimistic outlook, good communication skills, and constructive approaches to dealing with loneliness and anger
- Describe common psychological disorders
- List the warning signs of suicide
- Describe the different types of help available for psychological problems

TEST YOUR KNOWLEDGE

1. Normality is a key component of psychological health.
True or False?
2. Trying to think rationally about what bothers you won't get you very far because psychological problems usually are due to emotions, not thinking.
True or False?
3. About how many Americans have a diagnosable psychological disorder during the course of a year?
 - a. 5%
 - b. 10%
 - c. 20%
4. People with enough willpower can force themselves to snap out of their depression.
True or false?
5. A person who attempts suicide but survives did not really intend to die.
True or false?

ANSWERS

1. **FALSE.** Normality simply means being close to average, and having unusual ideas or attitudes doesn't mean that a person is mentally ill.
2. **FALSE.** Research has shown that getting people to adopt more realistic attitudes and beliefs about themselves and others can alleviate depression.
3. **C.** Other than substance abuse problems, the most common types of disorders are simple phobias and depression. The majority of people with psychological disorders do not receive appropriate treatment.
4. **FALSE.** Depression, a disorder strongly linked to brain chemistry, can overcome whatever willpower a person has and make it impossible for her or him to make decisions.
5. **FALSE.** A person may intend to die but miscalculate how to successfully commit suicide.

P psychological health contributes to every dimension of wellness. It can be difficult to maintain emotional, social, or even physical wellness if you are not psychologically healthy.

Psychological health, however, is a broad concept—one that is as difficult to define as it is important to understand. That is why the first section of this chapter is devoted to explaining what psychological health is and is not. The rest of the chapter discusses a number of common psychological problems, their symptoms, and their treatments.

DEFINING PSYCHOLOGICAL HEALTH

Psychological health (or *mental health*) can be defined either negatively as the absence of sickness or positively as

the presence of wellness. The narrow, negative definition has two advantages: It concentrates attention on the worst problems and on the people most in need, and it avoids value judgments about the best way to lead our lives. If we think of everyone who is not severely mentally disturbed as being mentally healthy, however, we end up ignoring common problems that can be addressed. Finally, freedom from disorders is only one factor in psychological wellness.

Positive Psychology

A positive definition—psychological health as the presence of wellness—is a more ambitious goal.

During the 1960s Abraham Maslow adopted a perspective that he called “positive psychology” in his book *Toward a*

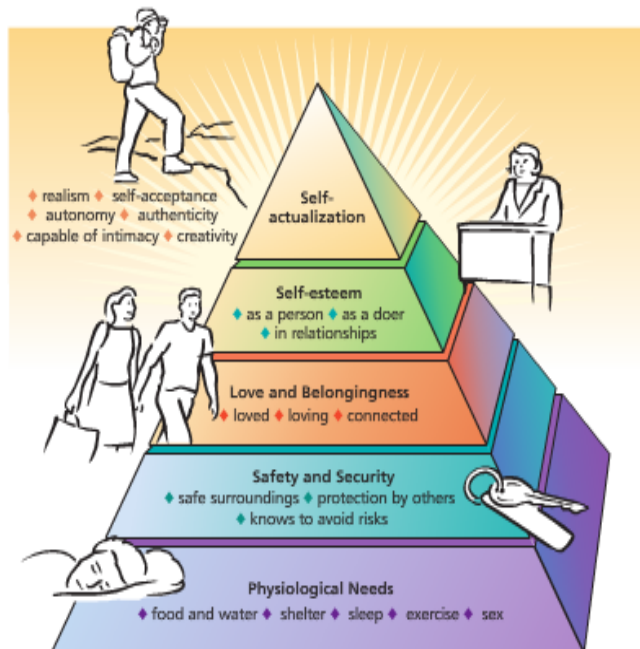


FIGURE 3.1 Maslow's hierarchy of needs.

SOURCE: Maslow, A. 1970. *Motivation and Personality*, 2nd ed. New York: Harper & Row.

Psychology of Being. Maslow defined a *hierarchy of needs* (Figure 3.1), listed here in order of decreasing importance:

- Physiological needs
- Safety
- Being loved
- Maintaining self-esteem
- Self-actualization

When urgent (life-sustaining) needs—such as the need for food and water—are satisfied, less basic needs take priority. Maslow's conclusions were based on his study of a group of visibly successful people who seemed to have lived, or to be living, at their fullest. He said that these people had achieved **self-actualization**; they had fulfilled a good measure of their human potential. Maslow suggested that self-actualized people all share certain qualities:

- **Realism.** Self-actualized people know the difference between what is real and what they want. As a result, they can cope with the world as it exists without demanding that it be different; they know what they can and cannot change. Just as important, realistic people accept evidence that contradicts what they want to believe.
- **Acceptance.** Psychologically healthy people have a **self-concept**, or **self-image**, that is positive but realistic. Such a person typically feels satisfaction and confidence in himself or herself, and so is said to have healthy **self-esteem**. Self-acceptance also means being tolerant of one's own imperfections—an ability that makes it easier to accept the imperfections of others.

- **Autonomy.** Psychologically healthy people are *autonomous*, meaning they can direct themselves, acting independently of their social environment. **Autonomy** is more than physical independence. It is social, emotional, and intellectual independence, as well.

- **Authenticity.** Autonomous people are not afraid to be themselves. Sometimes, in fact, their capacity for being “real” may give them a certain childlike quality. They respond in a genuine, or authentic, spontaneous way to whatever happens, without pretense or self-consciousness.

- **Capacity for intimacy.** Psychologically healthy people can share their feelings and thoughts without fear of rejection. A psychologically healthy person is open to the pleasure of physical contact and the satisfaction of being close to others—but without being afraid of the risks involved in intimacy, such as the risk of having one's feelings hurt. (Chapters 4 and 5 discuss intimacy in more detail.)

- **Creativity.** Psychologically healthy people continually look at the world with renewed appreciation. Such appreciation can inform one's creativity, which helps explain why so many mentally healthy people are creative.

Self-actualization is an ideal to strive for rather than something most people can reasonably hope to achieve. Maslow himself believed it was achieved quite rarely. Still, fulfilling one's own potential is a goal that everyone can work toward.

Positive psychology more recently has focused on clearly defining positive goals and on concrete, measurable ways of

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever had a reason to feel concerned about your own psychological health? If so, what was the reason? Did your concern lead you to talk to someone about the issue, or to seek professional help? If you did, what was the outcome, and how do you feel about it now?

psychological health Mental health, defined negatively as the absence of illness or positively as the presence of wellness.

self-actualization The highest level of growth in Maslow's hierarchy of needs.

self-concept The ideas, feelings, and perceptions a person has about himself or herself; also called *self-image*.

self-esteem Satisfaction and confidence in oneself; the valuing of oneself as a person.

autonomy Independence; the sense of being self-directed.

TERMS



You can develop happiness in any number of ways. The keys are to focus on work and activities you enjoy and to develop a supportive network of friends and family.

achieving them. According to psychologist Martin Seligman, we can achieve happiness by traveling three quite different but equally valid roads:

- *The pleasant life.* This life is dedicated to maximizing positive emotions about the past, present, and future, and to minimizing pain and negative emotions. Your feelings about the past should be of contentment, satisfaction, and serenity. Those about the present should include both immediate bodily pleasure and learned pleasures, such as the enjoyment of music. About the future, you should cultivate optimism and hopefulness.

- *The engaged life.* This life involves cultivating a strong character and exercising your talents. Most cultures admire personality traits such as courage, leadership, kindness, integrity, and originality along with the capacity to love and be loved. In this life, you become engaged and absorbed in what you do. You experience “flow” with complete immersion in what you do. Time stops, you are concentrated, and you feel completely at home.

Emotional intelligence is a positive personality trait and a key to being engaged and successful in life. An emotionally intelligent person can identify and manage his or her own emotions and the emotions of others. People with higher

Emotional intelligence is not only a positive personality trait but also a key to being engaged and successful in life.

emotion A feeling state involving some combination of thoughts, physiological changes, and an outward expression or behavior.

emotional intelligence The capacity to identify and manage your own emotions and the emotions of others.

TERMS

emotional intelligence can perceive their own emotions and also can harness them to reach their intended goals. They can read and understand the emotions of others and use that understanding to get along with people. Psychologists and educators believe that emotional intelligence is less fixed than abstract intelligence and can be taught.

- *The meaningful life.* Another road to happiness is to belong to and serve institutions that enable the best in human nature. Examples are institutions that educate and that cultivate strong families, democracy, or a free press. Many people find meaning in a connection to families, friends, religious institutions, and their work. Ultimately meaning derives from belonging to and serving something larger than ourselves. It is strongest when meaning comes from more than one source.

Seligman and his colleagues are developing methods of assessing these three ways of life and of teaching people how to become happier by adopting one or more of them. They need not be mutually exclusive.

Not everyone accepts the ideas of positive psychology—or even the concept of psychological health—because they involve value judgments that are inconsistent with psychology’s claim to be a science. Defining psychological health requires making assumptions and value judgments about what human goals are desirable, and some think these are matters for religion or philosophy. Positive psychology has also been criticized as promoting a short-sighted denial of reality and unwarranted optimism. In particular, therapists informed by existential philosophy believe that psychological health comes from acknowledging and accepting the painful realities of life.

What Psychological Health Is Not

Psychological health is not the same as psychological normality. Being mentally normal simply means being close to average. We can define normal body temperature because a few degrees above or below this temperature means physical sickness. But your ideas and attitudes can vary tremendously without your losing efficiency or feeling emotional distress. In fact, psychological diversity—with its wide range of ideas, lifestyles, and attitudes—is a valuable asset to society.

Never seeking help for personal problems does not prove you are psychologically healthy, any more than seeking help proves you are mentally ill. Unhappy people may avoid seeking help for many reasons, and severely disturbed people may not even realize they need help.

Further, we can’t say people are “mentally ill” or “mentally healthy” based solely on the presence or absence of symptoms. Consider the symptom of anxiety, for example. Anxiety can help

you face a problem and solve it before it becomes too big. Someone who shows no anxiety may be refusing to recognize problems or to do anything about them. A person who is anxious for good reason is likely to be judged more psychologically healthy in the long run than someone who is inappropriately calm.

Finally, we cannot judge psychological health from the way people look. All too often, a person who seems to be OK and even happy suddenly takes his or her own life. Usually such people lack close friends who might have known their desperation. At an early age, we learn to conceal our feelings and even to lie about them. We may believe that our complaints put unfair demands on others. While suffering in silence may sometimes be a virtue, it can also prevent us from getting help.

MEETING LIFE'S CHALLENGES

Life is full of challenges—large and small. Everyone, regardless of heredity and family influences, must learn to cope successfully with new situations and new people. For emotional and mental wellness, each of us must continue to grow psychologically, developing new and more sophisticated coping mechanisms to suit our current lives. We must develop an adult identity that enhances our self-esteem and autonomy. We must also learn to communicate honestly, handle anger and loneliness appropriately, and avoid being defensive.

Growing Up Psychologically

Our responses to life's challenges influence the development of our personality and identity. Psychologist Erik Erikson

proposed that development proceeds through a series of eight stages that extend throughout life. Each stage is characterized by a conflict or turning point—a time of increased vulnerability as well as increased potential for psychological growth (Table 3.1).

The successful mastery of one stage is a basis for mastering the next, so early failures can have repercussions in later life. Fortunately life provides ongoing opportunities for mastering these tasks. For example, although the development of trust begins in infancy, it is refined as we grow older. We learn to trust people outside our immediate family and to limit our trust by identifying people who are untrustworthy.

Developing an Adult Identity A primary task beginning in adolescence is the development of an adult identity: a unified sense of self, characterized by attitudes, beliefs, and ways of acting that are genuinely our own. People with adult identities know who they are, what they are capable of, what roles they play, and their place among their peers. They have a sense of their own uniqueness but also appreciate what they have in common with others. They view themselves realistically and can assess their strengths and weaknesses without relying on the opinions of others. Achieving an identity also means that we can form intimate relationships with others while maintaining a strong sense of self.

Our identities evolve as we interact with the world and make choices about what we'd like to do and whom we'd like to model ourselves after. Developing an adult identity is particularly challenging in a heterogeneous, secular, and relatively affluent society like ours, in which many roles are possible, many choices are tolerated, and ample time is allowed for experimenting and making up one's mind.

Table 3.1 Erikson's Stages of Development

AGE	CONFLICT	IMPORTANT PEOPLE	TASK
Birth–1 year	Trust vs. mistrust	Mother or other primary caregiver	In being fed and comforted, developing the trust that others will respond to your needs.
1–3 years	Autonomy vs. shame and self-doubt	Parents	In toilet training, locomotion, and exploration, learning self-control without losing the capacity for assertiveness.
3–6 years	Initiative vs. guilt	Family	In playful talking and locomotion, developing a conscience based on parental prohibitions that is not too inhibiting.
6–12 years	Industry vs. inferiority	Neighborhood and school	In school and playing with peers, learning the value of accomplishment and perseverance without feeling inadequate.
Adolescence	Identity vs. identity confusion	Peers	Developing a stable sense of who you are—your needs, abilities, interpersonal style, and values.
Young adulthood	Intimacy vs. isolation	Close friends, sex partners	Learning to live and share intimately with others, often in sexual relationships.
Middle adulthood	Generativity vs. self-absorption	Work associates, children, community	Doing things for others, including parenting and civic activities.
Older adulthood	Integrity vs. despair	Humankind	Affirming the value of life and its ideals.

SOURCE: Erikson, E. 1963. *Childhood and Society*. New York: Norton.

Early identities are often modeled after parents—or the opposite of parents, in rebellion against what they represent. Over time, peers, rock stars, sports heroes, and religious figures are added to the list of possible role models. In high school and college, people often join cliques that assert a certain identity, such as the “jocks,” the “brains,” or the “slackers.” Although much of our identity is internal—a way of viewing ourselves and the world—certain aspects of it can be external, such as styles of talking and dressing, ornaments like earrings, and hairstyles.

Early identities are rarely permanent. A student who works for good grades and approval one year can turn into a dropout devoted to hard rock and wild parties a year later. At some point, however, most of us adopt a more stable, individual identity that ties together the experiences of childhood and the expectations and aspirations of adulthood. Erikson's theory does not suggest that one day we suddenly assume our final identity and never change after that. Life is more interesting for people who continue evolving into more distinct individuals, rather than being rigidly controlled by their pasts. Identity reflects a lifelong process, and it changes as a person develops new relationships and roles.

Developing an adult identity is an important part of psychological wellness. Without a personal identity, we begin to feel confused about who we are; Erikson called this situation an **identity crisis**. Until we have “found ourselves,” we cannot have much self-esteem because a self is not firmly in place.

How far have you gotten in developing your adult identity? Write down a list of characteristics you think a friend who knows you well would use to describe you. Rank them from the most to the least important. Your list might include elements such as gender, socioeconomic status, ethnic and/or religious identification, choice of college or major, parents' occupations, interests and talents, attitudes toward drugs and alcohol, style of dress, the kinds of people with whom you typically associate, your expected role in society, and aspects of your personality. Which elements of your identity do you feel are permanent, and which do you think may change over time? Are there any characteristics missing from your list that you would like to add?

Another aid to developing an adult identity is to identify possible role models. Whom do you admire and want to be like? Which characteristics of that person do you want to emulate? How did that person acquire those characteristics, and how could you follow in her or his footsteps? Some role models might be willing to be mentors to you, spending time with you and sharing their wisdom.

Developing Intimacy Erikson's developmental stages don't end with establishing an adult identity. Learning to live intimately with others and finding a productive role for yourself in society are other tasks of adulthood—to be able to love and work.

People with established identities can form intimate relationships and sexual unions characterized by sharing, open communication, long-term commitment, and love. Those who lack a firm sense of self may have difficulty establishing relationships because they feel overwhelmed by closeness and the needs of another person. As a result, they experience only short-term, superficial relationships with others and may remain isolated.

Developing Values and Purpose in Your Life Erikson assigned his last two stages, *generativity versus self-absorption* and *integrity versus despair*, to middle adulthood and older adulthood. But these stages are concerned with values and purpose in life—issues that need to be addressed by young people and reexamined throughout life.

Values are criteria for judging what is good and bad, and they underlie our moral decisions and behavior. The first morality of the young child is to consider “good” to mean what brings immediate and tangible rewards, and “bad” to mean whatever results in punishment. An older child will explain right and wrong in terms of authority figures and rules. But the final stage of moral development, one that not everyone attains, is being able to conceive of

right and wrong in more abstract terms such as justice and virtue.

As adults we need to assess how far we have evolved morally and what values we actually have adopted. Without an awareness of our personal values, our lives may be hurriedly driven forward by immediate desires and the passing demands of others. Living according to values means doing the following:

- Considering your options carefully before making a choice
- Choosing between options without succumbing to outside pressures that conflict with your values
- Making a choice and acting on it rather than doing nothing

Your actions and how you justify them proclaim to others what you stand for.

Healthy self-esteem means regarding yourself as **good, competent, and worthy of love.**

Achieving Healthy Self-Esteem

Having a healthy level of self-esteem means regarding your self—which includes all aspects of your identity—as good, competent, and worthy of love. It is a critical component of wellness.

QUICK

STATS

96% of college students identify their parents as role models.

—Oregon State University/Texas A&M University Survey, 2006

Identity crisis Internal confusion about who one is.

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values Criteria for judging what is good and bad, which underlie an individual's moral decisions and behavior.

Developing a Positive Self-Concept Ideally a positive self-concept begins in childhood, based on experiences both within the family and outside it. Children need to develop a sense of being loved and being able to give love and to accomplish their goals. If they feel rejected or neglected by their parents, they may fail to develop feelings of self-worth. They may grow to have a negative concept of themselves.

Another component of self-concept is *integration*. An integrated self-concept is one that you have made for yourself—not someone else's image of you or a mask that doesn't quite fit. Important building blocks of self-concept are the personality characteristics and mannerisms of parents, which children may adopt without realizing it. Later they may be surprised to find themselves acting like one of their parents. Eventually such building blocks should be reshaped and integrated into a new, individual personality.

A further aspect of self-concept is *stability*. Stability depends on the integration of the self and its freedom from contradictions. People who have gotten mixed messages about themselves from parents and friends may have contradictory self-images, which defy integration and make them vulnerable to shifting levels of self-esteem. At times they regard themselves as entirely good, capable, and lovable—an ideal self—and at other times they see themselves as entirely bad, incompetent, and unworthy of love. Neither of these extreme self-concepts allows people to see themselves or others realistically, and their relationships with other people are filled with misunderstandings and ultimately with conflict.

The concepts we have about ourselves and others are an important part of our personalities. And all the components of our self-concepts profoundly influence our interpersonal relationships.

Meeting Challenges to Self-Esteem As an adult, you sometimes run into situations that challenge your self-concept. People you care about may tell you they don't love you or feel loved by you, for example, or your attempts to accomplish a goal may end in failure.

You can react to such challenges in several ways. The best approach is to acknowledge that something has gone wrong and try again, adjusting your goals to your abilities without radically revising your self-concept. Less productive responses are denying that anything went wrong and blaming someone else. These attitudes may preserve your self-concept temporarily, but in the long run they keep you from meeting the challenge.

The worst reaction is to develop a lasting negative self-concept in which you feel bad, unloved, and ineffective—in other words, to become demoralized. Instead of coping, the demoralized person gives up (at least temporarily), reinforcing the negative self-concept and setting in motion a cycle of bad self-concept and failure. In people who are genetically predisposed to depression, demoralization can progress to additional symptoms, which are discussed later in the chapter.

NOTICE YOUR PATTERNS OF THINKING One method for fighting demoralization is to recognize and test the negative thoughts and assumptions you may have about yourself and



A positive self-concept begins in infancy. The knowledge that he's loved and valued by his parents gives this baby a solid basis for lifelong psychological health.

others. Try to note exactly when an unpleasant emotion—feeling worthless, wanting to give up, feeling depressed—occurs or gets worse, to identify the events or daydreams that trigger that emotion, and to observe whatever thoughts come into your head just before or during the emotional experience. It is helpful to keep a daily journal about such events.

AVOID FOCUSING ON THE NEGATIVE Imagine that you are waiting for a friend to meet you for dinner, but he's 30 minutes late. What kinds of thoughts go through your head when something like this happens? You might wonder what caused the delay: Perhaps he is stuck in traffic, you think, or needs to help a roommate who has the flu. This kind of reaction is healthy for several reasons:

- **You aren't jumping to a conclusion or blaming your friend for a failure.** After all, he probably hasn't forgotten about you or decided to ditch you.
- **You are being reasonable by giving your friend the benefit of the doubt.** Things happen. Your friend probably has a good reason for not being there. He deserves a chance to explain, and may need your help dealing with the situation that made him late.



TAKE CHARGE

Realistic Self-Talk

Do your patterns of thinking make events seem worse than they truly are? Do negative beliefs about yourself become self-fulfilling prophecies? Substituting realistic self-talk for negative self-talk can help you

build and maintain self-esteem and cope better with the challenges in your life. Here are some examples of common types of distorted, negative self-talk, along with suggestions for more accurate and rational responses.

COGNITIVE DISTORTION	NEGATIVE SELF-TALK	REALISTIC SELF-TALK
Focusing on negatives	Babysitting is such a pain in the neck; I wish I didn't need the extra money so bad.	This is a tough job, but at least the money's decent and I can study once the kids go to bed.
Expecting the worst	I know I'm going to get an F in this course. I should just drop out of school now.	I'm not doing too well in this course. I should talk to my professor to see what kind of help I can get.
Overgeneralizing	My hair is a mess and I'm gaining weight. I'm so ugly. No one would ever want to date me.	I could use a haircut and should try to exercise more. This way I'll start feeling better about myself and will be more confident when I meet people.
Minimizing	It was nice of everyone to eat the dinner I cooked, even though I ruined it. I'm such a rotten cook.	Well, the roast was a little dry but they ate every bite. The veggies and rolls made up for it. I'm finally getting the hang of cooking!
Blaming others	Everyone I meet is such a jerk. Why aren't people more friendly?	I am going to make more of an effort to meet people who share my interests.
Expecting perfection	I cannot believe I flubbed that solo. They probably won't even let me audition for the orchestra next year.	It's a good thing I didn't stop playing when I hit that sour note. It didn't seem like anyone noticed it as much as I did.
Believing you're the cause of everything	Tom and Sara broke up and it's my fault. I shouldn't have insisted that Tom spend so much time with me and the guys.	It's a shame Tom and Sara broke up. I wish I knew what happened between them. Maybe Tom will tell me at soccer practice. At any rate, it isn't my fault; I've been a good friend to both of them.
Thinking in black and white	I thought that Mike was really cool, but after what he said today, I realize we have nothing in common.	I was really surprised that Mike disagreed with me today. I guess there are still things I don't know about him.
Magnifying events	I stuttered when I was giving my speech today in class. I must have sounded like a complete idiot. I'm sure everyone is talking about it.	My speech went really well, except for that one stutter. I bet most people didn't even notice it, though.

- **You avoid personalizing the situation in such a way that you feel hurt or betrayed.** Jumping to a negative conclusion (such as "He isn't coming because he doesn't really like me") can make you feel bad unnecessarily. The same thing happens if you place blame—either on your friend or on yourself—without knowing all the facts.

By contrast, people who are demoralized tend to use all-or-nothing thinking. They overgeneralize from negative events. They overlook the positive and jump to negative conclusions, minimizing their own successes and magnifying the successes

of others. They take responsibility for unfortunate situations that are not their fault, then jump to more negative conclusions and more unfounded overgeneralizations. Patterns of thinking that make events seem worse than they are in reality are called **cognitive distortions**.

cognitive distortion A pattern of negative thinking that makes events seem worse than they are.

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DEVELOP REALISTIC SELF-TALK When you react to a situation, an important piece of that reaction is your **self-talk**—the statements you make to yourself inside your own mind. To pick up on our earlier example, suppose your friend is late for a dinner date. As you wait for your friend to arrive, your self-talk has a profound effect on your reaction to his lateness.

Someone who is demoralized or wrestling with a poor self-concept might immediately react with negative self-talk: *“He isn’t coming. It’s my fault; he probably doesn’t like me because I’m boring. I bet he’s with someone else.”* This type of self-talk assigns blame (not just on your friend, but on yourself), is judgmental, and jumps to an unverified conclusion about the meaning of your friend’s lateness. In fact, you don’t know why he is late or what he is thinking.

More rational thinking and self-talk will not only help get you through the situation without feeling upset, but also help you avoid damaging your own self-concept. In this case, helpful self-talk is not negative, but neutral: *“He’s never late for dinner. Something must be holding him up. I’ll call him and make sure everything is all right.”* This thinking recognizes that a problem may exist, but does not judge or assign blame.

In your own fight against demoralization, it may be hard to think of a rational response until hours or days after the event that upset you. Responding rationally can be especially hard when you are having an argument with someone else,

which is why people often say things they don’t mean in the heat of the moment or develop hurt feelings even when the other person had no intention of hurting them.

Once you get used to noticing the way your mind works, however, you may be able to catch yourself thinking negatively and change the process before it goes too far. This approach to controlling your reactions is not the same as positive thinking—which means substituting a positive thought for a negative one. Instead you simply try to make your thoughts as logical and accurate as possible, based on the facts of the situation as you know them, and not on snap judgments or conclusions that may turn out to be false.

Demoralized people can be tenacious about their negative beliefs—so tenacious that they make their beliefs come true in a self-fulfilling prophesy. For example, if you conclude that you are so boring that no one will like you anyway, you may decide not to bother socializing. This behavior could make the negative belief become a reality because you limit your opportunities to meet people and develop new relationships.

For additional tips on changing distorted, negative ways of thinking, see the box “Realistic Self-Talk.”

self-talk The statements a person makes to himself or herself.

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Being Less Defensive

Sometimes our wishes come into conflict with people in our lives or with our own conscience, and we become frustrated and anxious. If we cannot resolve the conflict by changing the external situation, we try to resolve the conflict internally by rearranging our thoughts and feelings. Table 3.2 lists some

Table 3.2 Defense and Coping Mechanisms

MECHANISM	DESCRIPTION	EXAMPLE
Projection	Reacting to unacceptable inner impulses as if they were from outside the self	A student who dislikes his roommate feels that the roommate dislikes him.
Repression	Expelling from awareness an unpleasant feeling, idea, or memory	The child of an alcoholic, neglectful father remembers only when his father showed consideration and love.
Denial	Refusing to acknowledge to yourself what you really know to be true	A person believes that smoking cigarettes won’t harm her because she’s young and healthy.
Displacement	Shifting your feelings about a person to another person	A student who is angry with one of his professors returns home and yells at one of his housemates.
Dissociation	Falling into a state of altered consciousness to avoid emotional distress	A woman who was raped experiences frightening images and confusion when something reminds her of the event.
Rationalization	Giving a false, acceptable reason when the real reason is unacceptable	A shy young man decides not to attend a dorm party, telling himself he’d be bored.
Reaction formation	Concealing emotions or impulses by exaggerating the opposite ones	A student struggling with homosexual impulses engages in gay-bashing.
Substitution	Replacing an unacceptable or unobtainable goal with an acceptable one	In love with an unavailable partner, a man throws himself into training for a marathon.
Passive-aggressive behavior	Expressing hostility toward someone by being covertly uncooperative or passive	A person tells a coworker, with whom she competes for assignments, that she’ll help him with a project but then never follows through.
Humor	Finding something funny in unpleasant situations	A student whose bicycle has been stolen thinks how surprised the thief will be when he or she starts downhill and discovers the brakes don’t work.

standard **defense mechanisms**. The drawback of many of these coping mechanisms is that they succeed temporarily, but make finding ultimate solutions much harder.

Recognizing your own defense mechanisms can be difficult because they've probably become habits, occurring unconsciously. But we all have some inkling about how our minds operate. By remembering the details of conflict situations you have been in, you may be able to figure out which defense mechanisms you used in successful or unsuccessful attempts to cope. Try to look at yourself as an objective, outside observer would and analyze your thoughts and behavior in a psychologically stressful situation from the past. Having insight into what strategies you typically use can lead to new, less defensive, and more effective ways of coping in the future.

Being Optimistic

Most of us have a predisposition toward optimism or pessimism. **Pessimism** is a tendency to focus on the negative and expect an unfavorable outcome; **optimism** is a tendency to dwell on the hopeful and expect a favorable outcome. Pessimists not only expect repeated failure and rejection but also accept it as deserved. They do not see themselves as capable of success and irrationally dismiss any evidence of their own accomplishments. This negative point of view is learned, typically at a young age from parents and other authority figures. Optimists, on the other hand, consider bad events to be more temporary than permanent, consider failure to be limited to the area of life in which it occurred rather than pervasive, hope that the causes of negative events are temporary, and ascribe negative events to other causes instead of blaming themselves.

You can learn to be optimistic by recording adverse events in a diary, along with the reactions and beliefs with which you met those events. By doing so, you learn to recognize and dispute the false, negative predictions you generate about yourself, like "The problem is going to last forever and ruin everything, and it's all my fault." Refuting such negative self-talk frees energy for realistic coping.

Maintaining Honest Communication

Another important area of psychological functioning is communicating honestly with others. It can be very frustrating for us and for people around us if we cannot express what we want and feel. Others can hardly respond to our needs if they don't know what those needs are. We must recognize what we want to communicate and then express it clearly.

Some people know what they want others to do but don't state it clearly because they fear denial of the request, which they interpret as personal rejection. Such people might benefit from assertiveness training: learning to insist on their rights and to bargain for what they want. **Assertiveness** includes being able to say no or yes depending on the situation.

Communicating your feelings appropriately and clearly is important. For example, if you tell people you feel sad, they may have various reactions. If they feel close to you, they may express an intimate thought of their own. Or they may feel guilty because they think you're implying they have caused your sadness. They may even be angry because they feel you expect them to cheer you up.

Depending on your intention and your prediction of how a statement will be taken, you may or may not wish to make it. For example, if you say "I feel like staying home tonight," you may also be implying something different. You could really be saying "Don't bother me" or opening a negotiation about what you would be willing to do that evening, given the right event or incentive. Although this approach may help you avoid a confrontation (or even a discussion) with someone else, it is unfair because you are not really being clear about what you want.

Good communication means expressing yourself clearly. You don't need any special psychological jargon to communicate effectively.

Dealing with Loneliness

It can be hard to strike the right balance between being alone and being with others. Some people are motivated to socialize by a fear of being alone—not the best reason to spend time with others. If you discover how to be happy by yourself, you'll be better able to cope with periods when you're forced to be alone—for example, when you've just broken off a romantic relationship or when your usual friends are away on vacation.

Unhappiness with being alone may come from interpreting it as a sign of rejection—that others are not interested in spending time with you. Before you reach such a conclusion, be sure that you give others a real chance to get to know you.

Examine your patterns of thinking: You may harbor unrealistic expectations about other people—for example, that everyone you meet must like you and, if they don't, you must be terribly flawed. You might also consider the possibility that you expect too much from new acquaintances and, sensing this, they start to draw back, triggering your feelings of rejection. Not everyone you meet is a suitable and willing person for a close or intimate relationship. Feeling pressure to have such a relationship may lead you to take up with someone whose interests and needs are remote from yours or whose need to be cared for

Defense mechanisms may work right now, but they can keep you from finding long-term solutions to conflicts.

defense mechanism A mental mechanism for coping with conflict or anxiety.

pessimism The tendency to expect an unfavorable outcome.

optimism The tendency to expect a favorable outcome.

assertiveness Expression that is forceful but not hostile.

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leaves you with little time of your own. You will have traded loneliness for potentially worse problems.

Loneliness is a passive feeling state. If you decide that you're not spending enough time with people, take action to change the situation. College life provides many opportunities to meet people. If you're shy, you may have to push yourself to join a group. Look for something you've enjoyed in the past or in which you have a genuine interest.

If your loneliness is the result of missing absent friends, remember that communication at a distance is cheaper and easier than ever before. Texting, e-mail, and cell phones are immediate and satisfying ways to keep up with friends.

Dealing with Anger

Common wisdom holds that expressing anger is beneficial for psychological and physical health. However, recent studies have questioned this idea by showing that overtly hostile people seem to be at higher risk for heart attacks. Angry words or actions don't contribute to psychological wellness if they damage relationships or produce feelings of guilt or loss of control. Perhaps the best way to resolve this contradiction is to distinguish between a gratuitous expression of anger and a reasonable level of self-assertiveness.

At one extreme are people who never express anger or any opinion that might offend others, even when their own rights and needs are being jeopardized. They may be trapped in unhealthy relationships or chronically deprived of satisfaction at work and at home. If you have trouble expressing your anger, consider training in assertiveness and appropriate expressions of anger to help you learn to express yourself constructively.

At the other extreme are people whose anger is explosive or misdirected—a condition called *intermittent explosive disorder (IED)*. IED is often accompanied by depression or another disorder. Explosive anger or rage, like a child's tantrum, renders an individual temporarily unable to think straight or to act in his or her own best interest. During an IED episode, a person may lash out uncontrollably, hurting someone else or destroying property. Anyone who expresses anger this way should seek professional help.

Managing Your Own Anger If you feel explosive anger coming on, consider the following two strategies to head it off.

First, try to *reframe* what you're thinking at that moment. You'll be less angry at another person if there is a possibility that his or her behavior was not intentionally directed against you. Imagine that another driver suddenly cuts in front of you. You would certainly be angry if you knew the other driver did it on purpose, but you probably would be less angry if you knew he simply did not see you. If you're angry because you've just been criticized, avoid mentally replaying scenes from the past when you received other unjust criticisms. Think about what is happening now, and try to act differently than in the past—less defensively and more analytically.

Second, until you're able to change your thinking, try to *distract* yourself. Use the old trick of counting to 10 before



College offers many antidotes to loneliness in the forms of clubs, organized activities, sports, and just hanging out with friends.

you respond, or start concentrating on your breathing. If necessary, cool off by leaving the situation until your anger has subsided. This does not mean that you should permanently avoid the issues and people who make you angry. Return to the matter after you've had a chance to think clearly about it.

Dealing with Anger in Other People Anger can be infectious, and it disrupts cooperation and communication. If someone you're with becomes very angry, respond "asymmetrically" by reacting not with anger but with calm. Try to validate the other person by acknowledging that he or she has some reason to be angry. This does not mean apologizing if you don't think you're to blame, or accepting verbal abuse, which is always inappropriate. Try to focus on solving the problem by allowing the person to explain why he or she is so angry and what can be done to alleviate the situation. Finally, if the person cannot be calmed, it may be best to disengage, at least temporarily. After a time-out, you may have better luck trying to solve the problem rationally.

PSYCHOLOGICAL DISORDERS

All of us feel anxious at times. In dealing with anxiety, we may avoid doing something that we want to do or should do. Most of us have periods of feeling down when we become



DIVERSITY MATTERS

Ethnicity, Culture, and Psychological Disorders

Psychological disorders differ in incidence and symptoms across cultures and ethnic groups around the world. This variability is usually attributable to cultural differences—factors such as how symptoms are interpreted and communicated, whether treatment is sought, and whether a social stigma is attached to a particular symptom or disorder.

Expression of Symptoms

People from different cultures or groups may manifest or describe symptoms differently. Consider the following examples:

- In Japan, people with social phobia may be more distressed about the imagined harm their social clumsiness causes to others than about their own embarrassment.
- Older African Americans may express depression in atypical ways—for example, denying depression by taking on a multitude of extra tasks.
- Somatization, the indirect reporting of psychological distress through non-specific physical symptoms, is more prevalent among African Americans, Puerto Ricans, and Chinese Americans.

- Schizophrenia may manifest with different delusions depending on the local culture.

Differing Attitudes

It is relatively easy for Americans of northern European descent to regard an emotional problem as psychological in nature and to therefore accept a psychological treatment. For other groups, symptoms of psychological distress may be viewed as a spiritual problem, best dealt with by religious figures.

People from some groups may have little hesitation about communicating intimate, personal problems to professional care providers. However, for others, particularly men and members of certain ethnic groups, loss of emotional control may be seen as a weakness.

In addition, the use of mental health services is viewed negatively in many cultures; this stigma may partly account for the fact that African Americans and Asian Americans/Pacific Islanders are only about half as likely as whites to use any type of mental health service.

Assimilation

One of the largest immigrant groups in the United States is from Mexico. Surpris-

ingly, surveys show that these immigrants are psychologically healthier than their own children born in the United States. Mexican, Cuban, and Puerto Rican Hispanics in this country come from a culture where family bonds are valued and divorce is rare. As they assimilate and begin using English exclusively, however, these family bonds tend to weaken, but less so for Cubans than for Puerto Ricans or Mexicans. With assimilation, the incidence of anxiety, depression, and substance abuse increases.

Biological Risk Factors

Biology can also play a role in the differences seen among patients of different ethnic groups. For example, psychotropic drugs are broken down in the body by a specific enzyme known as CYP2C19. Reduction of the activity of this enzyme is caused by two mutations, one of which appears to be found only in Asian populations. These “poor metabolizers” are very sensitive to medications that are broken down by this enzyme. The percentage of poor metabolizers among Asians is about 20%; among Latinos, about 5%; and among whites, 3%. Asian patients thus tend to have more adverse reactions to the doses of drugs standardized principally on white patients in the United States.

pessimistic, less energetic, and less able to enjoy life. Many of us are bothered at times by irrational thoughts or odd feelings. Such feelings and thoughts can be normal responses to the ordinary challenges of life, but when emotions or irrational thoughts start to interfere with daily activities and rob us of our peace of mind, they can be considered symptoms of a psychological disorder.

Psychological disorders are generally the result of many factors. Genetic differences, which underlie differences in how the brain processes information and experiences, are known to play an important role, especially in certain disorders. However, exactly which genes are involved, and how they alter the structure and chemistry of the brain, is still under study. Learning and life events are important, too: Identical twins often don’t have the same psychological disorders despite having identical genes. Some people have been exposed to more traumatic events than others, leading either to greater vulnerability to future traumas or, conversely, to the development of better coping skills. Further, what your parents, peers, and others have taught you strongly influences your level of self-esteem and how you deal with frightening or depressing life events (see the box “Ethnicity, Culture, and Psychological Disorders”).

This section examines some of the more common psychological disorders, including anxiety disorders, mood disorders, and schizophrenia. (Table 3.3 shows the likelihood of these disorders occurring during one’s lifetime and during the past year.)

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think about the last time you were truly angry. What triggered your anger? How did you express it? Do you typically handle your anger in the same manner? How appropriate does your anger management technique seem?



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Table 3.3

Prevalence of Selected Psychological Disorders among Americans

DISORDER	MEN		WOMEN	
	LIFETIME PREVALENCE (%)	PAST YEAR PREVALENCE (%)	LIFETIME PREVALENCE (%)	PAST YEAR PREVALENCE (%)
Anxiety disorders				
Specific phobia	6.7	4.4	15.7	13.2
Social phobia	11.1	6.6	15.5	9.1
Panic disorder	2.0	1.3	5.0	3.2
Generalized anxiety disorder	3.6	2.0	6.6	4.3
Obsessive-compulsive disorder	1.7	0.5	2.8	0.8
Posttraumatic stress disorder	5.0	1.5	10.4	3.5
Mood disorders				
Major depressive episode	11.2	6.6	20.7	9.8
Manic episode	1.4	1.2	1.9	1.4
Schizophrenia and related disorders	0.8	0.6	0.4	0.3
Dementia	Depends on life expectancy	11.1 (age ≥ 71)	Depends on life expectancy	15.7 (age ≥ 71)

NOTE: Rates of the prevalence of dementia are highly dependent on how much impairment is considered dementia and on the age range of the population. Both Alzheimer's type and vascular dementia are included.

SOURCES: Centers for Disease Control and Prevention. 2011. Mental illness surveillance among adults in the United States. *Morbidity and Mortality Weekly Report* 60 (Suppl):1–29; Kessler, R. C., et al. 2005. Prevalence, severity, and comorbidity of twelve-month DSM-IV disorders in the National Comorbidity Survey Replication (NCSR). *Archives of General Psychiatry* 62(6): 617–627; Kessler, R. C., et al. 1994. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Archives of General Psychiatry* 51(1): 8–19; Kessler, R. C., et al. 1995. Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry* 52(12): 1048–1060; Plassman, B. L., et al. 2007. Prevalence of dementia in the United States: the aging, demographics, and memory study. *Neuroepidemiology* 29:125–132; Kukull, W. A., et al. 2002. Dementia and Alzheimer disease incidence. *Archives of Neurology* 59 (Nov.): 1737–1776.

Anxiety Disorders

Fear is a basic and useful emotion. Its value for our ancestors' survival cannot be overestimated. For modern humans, fear motivates us to protect ourselves and to learn how to cope with new or potentially dangerous situations. We consider fear to be a problem only when it is out of proportion to real danger. **Anxiety** is another word for fear, especially a feeling of fear that is not in response to any definite threat. Anxiety is a disorder only when it occurs almost daily or in life situations that recur and cannot be avoided.

Specific Phobia The most common and understandable anxiety disorder, called **specific phobia**, is a fear of something definite like lightning, a particular type of animal, or a place. Snakes, spiders, and dogs are commonly feared animals; frightening locations are often high places or enclosed spaces. Sometimes, but not always, these fears originate in bad experiences, such as being bitten by a snake. A special kind of specific phobia is fear of blood, injections, or seeing injured people. These fears usually come from a tendency to faint or become nauseated in such situations.

QUICK

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26% of adult Americans are diagnosable with psychological disorders in any given year.

—National Institute of Mental Health, 2012

Social Phobia The 15 million Americans with **social phobia** fear humiliation or embarrassment while being observed by others. Fear of speaking in public is perhaps the most common phobia of this kind. Extremely shy people can have social fears that extend to almost all social situations. People with these kinds of fears may not continue in school as far as they could and may restrict themselves to lower-paying jobs where they do not have to come into contact with new people.

Panic Disorder People with **panic disorder** experience sudden unexpected surges in anxiety, accompanied by symptoms such as rapid and strong heartbeat, shortness of

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anxiety Fear that is not a response to any definite threat.

specific phobia A persistent and excessive fear of a specific object, activity, or situation.

social phobia An excessive fear of being observed by others; speaking in public is the most common example.

panic disorder A syndrome of severe anxiety attacks accompanied by physical symptoms.

breath, loss of physical equilibrium, and a feeling of losing mental control. Such attacks usually begin in one's early twenties and can lead to a fear of being in crowds or closed places or of driving or flying. Sufferers fear that a panic attack will occur in a situation from which escape is difficult (such as while in an elevator), where the attack could be incapacitating and result in a dangerous or embarrassing loss of control (such as while driving a car or shopping), or where no medical help would be available if needed (such as when a person is alone away from home). Fears such as these lead to avoidance of situations that might cause trouble. The fears and avoidance may spread to a large variety of situations until a person is virtually housebound, a condition called **agoraphobia**. People with panic disorder can often function normally in feared situations if someone they trust accompanies them.

Generalized Anxiety Disorder A basic reaction to future threats is to worry about them. **Generalized anxiety disorder (GAD)** is a diagnosis given to people whose worries have taken on a life of their own, pushing out other thoughts and refusing banishment by any effort of will. For someone with GAD, ordinary concerns can become sources of overwhelming worries.

The GAD sufferer's worrying is not completely unjustified—after all, thinking about problems can result in solving them. But this kind of thinking seems to just go around in circles, and the more you try to stop it, the more you feel at its mercy. The end result is a persistent feeling of nervousness, often accompanied by depression.

Obsessive-Compulsive Disorder Someone diagnosed with **obsessive-compulsive disorder (OCD)** contends with obsessions, compulsions, or both.

- **Obsessions** are recurrent, unwanted thoughts or impulses. Unlike the worries of GAD, they are not ordinary concerns but improbable fears such as of suddenly committing an antisocial act or of having been contaminated by germs.
- **Compulsions** are repetitive, difficult-to-resist actions usually associated with obsessions. A common compulsion is hand washing, associated with an obsessive fear of contamination by dirt. Other compulsions are counting and repeatedly checking whether something has been done—for example, whether a door has been locked or a stove turned off.

People with OCD feel anxious, out of control, and embarrassed. Their rituals can occupy much of their time and make them inefficient at work and difficult to live with.

Posttraumatic Stress Disorder People who suffer from **posttraumatic stress disorder (PTSD)** are reacting to severely traumatic events (events that produce a sense of terror and helplessness) such as physical violence to themselves or their loved ones. Trauma occurs in personal assaults (rape, military combat), natural disasters (floods, hurricanes), and tragedies like fires and airplane or car crashes.

Symptoms include reexperiencing the trauma in dreams and in intrusive memories, trying to avoid anything associated with the trauma, and numbing of feelings. Hyperarousal, sleep disturbances, and other symptoms of anxiety and depression also commonly occur. Such symptoms can last months or even years. PTSD symptoms often decrease substantially within three months, but up to one-third of PTSD sufferers do not fully recover. Recovery may be slower in those who have previously experienced trauma or who suffer from ongoing psychological problems.

The terrorist attacks on September 11, 2001, brought PTSD into the public spotlight. Among those affected were survivors, rescue workers, passersby, residents of Manhattan in general, and to some extent, television viewers around the world who saw countless repeated images of the devastation. An estimated 150,000 New Yorkers suffered PTSD following the attacks; some were still experiencing symptoms five years later. Hurricane Katrina had a similarly devastating effect; in one survey, 19% of police officers and 22% of firefighters in the Gulf Coast states reported symptoms of PTSD. Soldiers wounded in combat are also at risk for PTSD; among soldiers wounded in Iraq or Afghanistan, rates of PTSD increased during the first year after the injury, suggesting that the emotional impact deepens with time. When symptoms persist and daily functioning is disrupted, professional help is needed.

QUICK

STATS

7.7 million adult Americans suffer from PTSD.

—National Institute of Mental Health, 2010

Treating Anxiety Disorders Therapies for anxiety disorders range from medication to psychological interventions concentrating on a person's thoughts and behavior. Both drug treatments and cognitive-behavioral therapies are effective in panic disorder, OCD, and GAD. Specific phobias are best treated without drugs.

TERMS

agoraphobia An anxiety disorder characterized by fear of being alone away from help and by avoidance of many different places and situations; in extreme cases, a fear of leaving home.

generalized anxiety disorder (GAD) An anxiety disorder characterized by excessive, uncontrollable worry about all kinds of things and anxiety in many situations.

obsessive-compulsive disorder (OCD) An anxiety disorder characterized by uncontrollable, recurring thoughts and the performing of senseless rituals.

obsession A recurrent, irrational, unwanted thought or impulse.

compulsion An irrational, repetitive, forced action, usually associated with an obsession.

posttraumatic stress disorder (PTSD) An anxiety disorder characterized by reliving traumatic events through dreams, flashbacks, and hallucinations.

Mood Disorders

Daily, temporary mood changes typically don't affect our overall emotional state or level of wellness. A person with a **mood disorder**, however, experiences emotional disturbances that are intense and persistent enough to affect normal functioning. The two most common mood disorders are depression and bipolar disorder.

Depression The National Institutes of Health estimates that **depression** strikes nearly 10% of Americans annually, making it the most common mood disorder. Depression affects the young as well as adults; about 9% of adolescents aged 12–17 suffer a major depressive episode each year, and nearly 50% of college students report depression severe enough to hinder their daily functioning. Depression tends to be more severe and persistent in blacks than in people of other races. Despite this, fewer than 50% of blacks affected by depression are treated for it. Almost twice as many women have serious depression as men. Overall, about three times as many women as men attempt suicide, but women's attempts are less likely to be lethal.

Why women have more depression than men is a matter of debate. Some experts think much of the difference is due to reporting bias: Women are more willing to admit experiencing negative emotions, being stressed, or having difficulty coping. Women may also be more likely to seek treatment. Other experts point to biologically based sex differences, particularly in the level and action of hormones. In addition, women's social roles and expectations are often different from those of men. Women may put more emphasis on relationships in determining self-esteem, so the deterioration of a relationship is a cause of depression that can hit women harder than men. In addition, culturally determined gender roles are more likely to place women in situations where they have less control over key life decisions, and lack of autonomy is associated with depression.

Depression takes different forms but usually involves demoralization and can include the following:

- A feeling of sadness and hopelessness
- Loss of pleasure in doing usual activities
- Poor appetite and weight loss
- Insomnia or disturbed sleep
- Restlessness or fatigue
- Thoughts of worthlessness and guilt
- Trouble concentrating or making decisions
- Thoughts of death or suicide

A person experiencing depression may not have all of these symptoms. Sometimes instead of poor appetite and insomnia, the opposite occurs—eating too much and sleeping too long. (Depression may contribute to weight gain in young women.) People can have multiple symptoms of depression without feeling depressed, although they usually experience a loss of interest or pleasure. (See the box “Are You Suffering from a Mood Disorder?”)

In major depression, symptoms are often severe; a diagnosis of *dysthymic disorder* may be applied to people who experience persistent symptoms of mild or moderate depression for two years or longer. In some cases, depression is a clear-cut reaction to specific events, such as the loss of a loved one or failing in school or work, whereas in other cases no trigger event is obvious.

One of the principal dangers of severe depression is suicide, which is discussed later in this chapter.

TREATING DEPRESSION Although treatments are highly effective, only about 35% of people who suffer from depression currently seek treatment. Treatment for depression depends on its severity and on whether the depressed person is suicidal. The best initial treatment for moderate to severe depression is probably a combination of drug therapy and psychotherapy. Newer prescription antidepressants work well, although they may need several weeks to take effect, and patients may need to try multiple medications before finding one that works well. Therefore, when suicidal impulses are strong, hospitalization may be necessary.

Antidepressants work by affecting key neurotransmitters in the brain, including serotonin (Figure 3.2). The herbal supplement St. John's wort may also affect serotonin levels and may be effective in helping with mild to moderate symptoms of depression. However, it is not subject to the same testing and regulation as prescription medications, and it may interact with certain medications, reducing their effectiveness. These include oral contraceptives and some medications for heart disease, depression, HIV infection, and seizures. The safety of St. John's wort in pregnancy has not been established. Anyone who may be suffering from depression should seek a medical evaluation rather than self-treating with supplements.

When women take antidepressants, they may need a lower dose than men; at the same dosage, blood levels of medication tend to be higher in women. An issue for women who may become pregnant is whether antidepressants can harm a fetus or newborn. The best evidence indicates that the most frequently prescribed types of antidepressants do not cause birth defects, although some studies have reported withdrawal symptoms in some newborns whose mothers used certain antidepressants.

Electroconvulsive therapy (ECT) is effective for severe depression when other approaches have failed, including medications and other electronic therapies such as magnetic

mood disorder An emotional disturbance that is intense and persistent enough to affect normal function; two common mood disorders are depression and bipolar disorder.

TERMS

depression A mood disorder characterized by loss of interest, sadness, hopelessness, loss of appetite, disturbed sleep, and other physical symptoms.

electroconvulsive therapy (ECT) The use of electric shock to induce brief, generalized seizures; used in the treatment of selected psychological disorders.



ASSESS YOURSELF

Are You Suffering from a Mood Disorder?

You should be evaluated by a professional if you've had five or more of the following symptoms for more than two weeks or if any of these symptoms causes such a big change that you can't keep up your usual routine.

When You're Depressed

- ☐ You feel sad or cry a lot, and it doesn't go away.
- ☐ You feel guilty for no reason; you feel you're no good; you've lost your confidence.
- ☐ Life seems meaningless, or you think nothing good is ever going to happen again.
- ☐ You have a negative attitude a lot of the time, or it seems as if you have no feelings.
- ☐ You don't feel like doing a lot of the things you used to like—music, sports, being with friends, going out, and so on—and you want to be left alone most of the time.
- ☐ It's hard to make up your mind. You forget lots of things, and it's hard to concentrate.
- ☐ You get irritated often. Little things make you lose your temper; you overreact.
- ☐ Your sleep pattern changes: You start sleeping a lot more or you have trouble falling asleep at night; or you wake up really early most mornings and can't get back to sleep.
- ☐ Your eating pattern changes: You've lost your appetite or you eat a lot more.
- ☐ You feel restless and tired most of the time.
- ☐ You think about death or feel as if you're dying or have thoughts about committing suicide.

When You're Manic

- ☐ You feel high as a kite, like you're "on top of the world."
- ☐ You get unrealistic ideas about the great things you can do—things that you really can't do.
- ☐ Thoughts go racing through your head, you jump from one subject to another, and you talk a lot.
- ☐ You're a nonstop party, constantly running around.
- ☐ You do too many wild or risky things—with driving, with spending money, with sex, and so on.
- ☐ You're so "up" that you don't need much sleep.
- ☐ You're rebellious or irritable and can't get along at home or school or with your friends.

If you are concerned about depression in yourself or a friend, or if you are thinking about hurting or killing yourself, talk to someone about it and get help immediately.

stimulation. In ECT, an epileptic-like seizure is induced by an electrical impulse transmitted through electrodes placed on the head. Patients are given an anesthetic and a muscle relaxant to reduce anxiety and prevent injuries associated with seizures. ECT usually includes three treatments per week for two to four weeks.

One type of depression is treated by having sufferers sit with eyes open in front of a bright light source every morning. These patients have **seasonal affective disorder (SAD)**; their depression worsens during winter months as daylight hours diminish, then improves with the spring and summer. The American Psychiatric Association estimates that 10–20% of Americans suffer symptoms that may be linked to SAD. SAD is more common among people who live at higher latitudes, where there are fewer hours of light in winter. Light therapy may work by extending the perceived length of the

day and thus convincing the brain that it is summertime even during the winter months.

Mania and Bipolar Disorder People who experience **mania**, a less common feature of mood disorders, are restless, have a lot of energy, need little sleep, and often talk nonstop. They may devote themselves to fantastic projects and spend more money than they can afford. Many manic people swing

TERMS

seasonal affective disorder (SAD) A mood disorder characterized by seasonal depression, usually occurring in winter, when there is less daylight.

mania A mood disorder characterized by excessive elation, irritability, talkativeness, inflated self-esteem, and expansiveness.

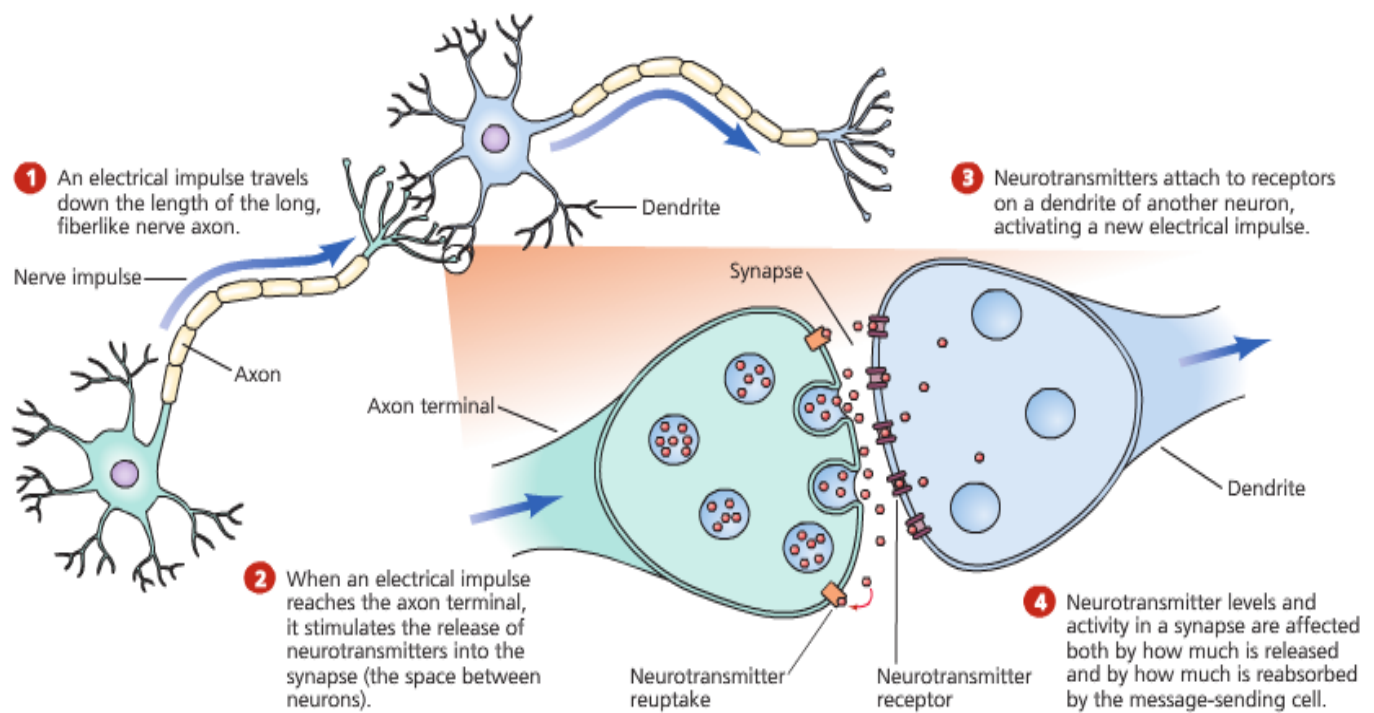


FIGURE 3.2 Nerve cell communication. Nerve cells (neurons) communicate through a combination of electrical impulses and chemical messages. Neurotransmitters such as serotonin and norepinephrine alter the overall responsiveness of the brain and are responsible for mood, level of attentiveness, and other psychological states. Many psychological disorders are related to problems with neurotransmitters and their receptors, and drug treatments frequently target them. For example, the antidepressant drug Prozac increases levels of serotonin by slowing the resorption (reuptake) of serotonin.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever wondered if you were depressed? Try to recall your situation at the time. How did you feel, and what do you think brought about those feelings? What, if anything, did you do to bring about change and to feel better?

between manic and depressive states, a syndrome called **bipolar disorder** because of the two opposite poles of mood. Bipolar disorder affects men and women equally. Tranquilizers are used to treat individual manic episodes, while special drugs such as the salt lithium carbonate taken daily can prevent future mood swings. Anticonvulsants (used to prevent epileptic seizures) are also prescribed to stabilize moods; examples are Tegretol (carbamazepine) and Lamictal (lamotrigene).

Schizophrenia

Schizophrenia is a disorder that affects one's thinking and perceptions of reality. The disease can be severe and debilitating or so mild that it's hardly noticeable. Although people are capable of diagnosing their own depression, they usually don't diagnose their own schizophrenia because they often can't see that anything is wrong. This disorder is not rare; in fact, 1 in every 100 people has a schizophrenic episode sometime in his or her lifetime, most commonly starting in adolescence.

Scientists are uncertain about the exact causes of schizophrenia. Researchers have identified possible chemical and structural differences in the brains of people with the disorder as well as several genes that appear to increase risk. Schizophrenia is likely caused by a combination of genes and environmental factors that occur during pregnancy and development. For example, children born to older fathers have higher rates of schizophrenia, as do children with prenatal exposure to certain infections or medications.

Some general characteristics of schizophrenia include the following:

- **Disorganized thoughts.** Thoughts may be expressed in a vague or confusing way.
- **Inappropriate emotions.** Emotions may be either absent or strong but inappropriate.
- **Delusions.** People with delusions—firmly held false beliefs—may think that their minds are controlled by outside forces, that people can read their minds, that they are great personages like Jesus Christ or the president of the United States, or that they are being persecuted by a group such as the CIA.

bipolar disorder A mental illness characterized by alternating periods of depression and mania.

schizophrenia A psychological disorder that involves a disturbance in thinking and in perceiving reality.

TERMS

- **Auditory hallucinations.** Schizophrenic people may hear voices when no one is present.
- **Deteriorating social and work functioning.** Social withdrawal and increasingly poor performance at school or work may be so gradual that they are hardly noticed at first.

None of these characteristics is invariably present. Some schizophrenic people are quite logical except on the subject of their delusions. Others show disorganized thoughts but no delusions or hallucinations.

A schizophrenic person needs help from a mental health professional. Suicide is a risk in schizophrenia, and expert treatment can reduce that risk and minimize the social consequences of the illness by shortening the period when symptoms are active. The key element in treatment is regular medication. At times medication is like insulin for diabetes—it makes the difference between being able to function or not. Sometimes hospitalization is temporarily required to relieve family and friends.

SUICIDE

In the United States, suicide is the third leading cause of death for young people ages 15 to 24 and the 11th leading cause for people of all ages. About 15 attempts are made for every death. In this country, men have much higher suicide rates than women; white men over age 65 have the highest suicide rate (Figure 3.3). Whites and Native Americans have higher rates than most other groups, but rates among blacks have been rising. Women attempt three times as many suicides as men, yet men succeed at more than three times the rate of women. Suicide rates among adolescents and young adults and among adults over 65 have been falling for the last two decades.

1 in 100 Americans has a schizophrenic episode at least once in his or her lifetime.

Suicide rarely occurs without warning signs. About 60% of people who commit suicide are depressed. The more symptoms of depression a person has, the greater the risk. Other warning signs include the following:

- Expressing the wish to be dead or revealing contemplated methods.
- Increasing social withdrawal and isolation.
- A sudden, inexplicable lightening of mood (which can mean the person has decided to commit suicide).

Certain risk factors increase the likelihood of suicide:

- A history of previous attempts.
- A suicide by a family member or friend.
- Readily available means, such as guns or pills.
- A history of substance abuse or eating disorders.
- Serious medical problems.

Don't be misled by certain widespread myths about suicide:

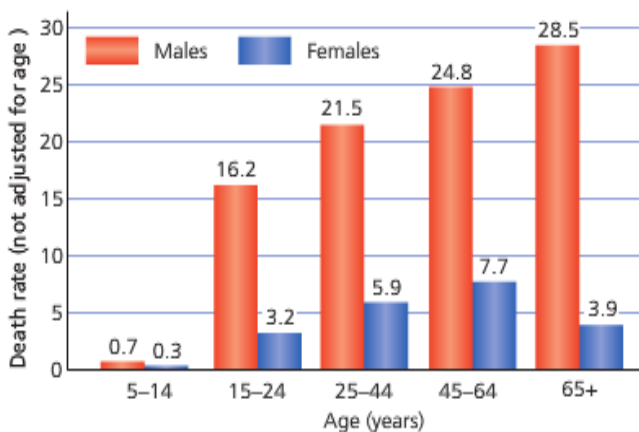
Myth People who really intend to kill themselves do not let anyone know about it.

Fact This belief can be an excuse for doing nothing when someone says he or she might commit suicide. In fact, most people who eventually commit suicide have talked about doing it.

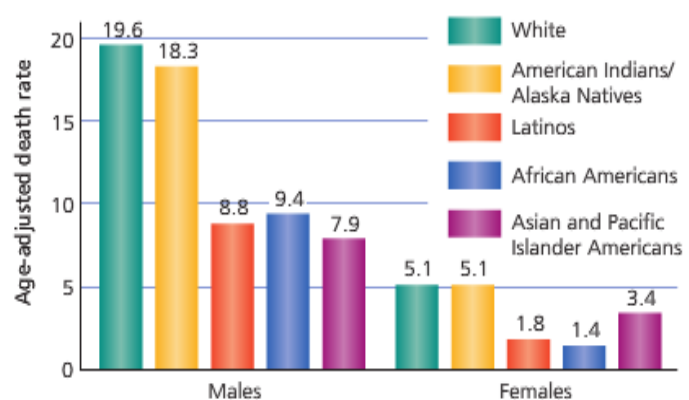
Myth People who made a suicide attempt but survived did not really intend to die.

Fact This may be true for certain people, but people who seriously want to end their life may fail because they misjudge what it takes. Even a pharmacist may misjudge the lethal dose of a drug.

Myth People who succeed in suicide really wanted to die.



(a) Suicide rate by age and gender



(b) Suicide rate by ethnicity and gender (all ages)

FIGURE 3.3 Rates of suicide per 100,000 people in the United States. The rate of suicide varies by gender, age, and ethnicity. Rates are higher among men than among women at all ages and are higher among whites compared to other groups. White men over age 65 have the highest rate of suicide. The age-adjusted national suicide rate is 10.0 per 100,000 people. These statistics are from 2006.

SOURCE: National Center for Health Statistics. 2009. *Health, United States, 2009*. Hyattsville, MD: National Center for Health Statistics.

Fact We cannot be sure of that either. Some people are only trying to make a dramatic gesture or plea for help but miscalculate.

Myth People who really want to kill themselves will do it regardless of any attempts to prevent them.

Fact Few people are single-minded about suicide even at the moment of attempting it. People who are quite determined to take their lives today may change their minds completely tomorrow.

Myth Suicide is proof of mental illness.

Fact Many suicides are committed by people who do not meet ordinary criteria for mental illness, although people with depression, schizophrenia, and other psychological disorders have a much higher than average suicide rate.

Myth People inherit suicidal tendencies.

Fact Certain kinds of depression that lead to suicide do have a genetic component. But many examples of suicide running in a family can be explained by factors such as psychologically identifying with a family member who committed suicide, often a parent.

Myth All suicides are irrational.

Fact By some standards all suicides may seem “irrational.” But many people find it at least understandable that someone might want to commit suicide—for example, when approaching the end of a terminal illness or when facing a long prison term.

If you are severely depressed or know someone who is, expert help from a mental health professional is essential. Don't be afraid to discuss the possibility of suicide with someone you fear is suicidal. You won't give them an idea they haven't already thought of. Asking direct questions is the best way to determine whether someone seriously intends to commit suicide. Encourage your friend to talk and to take positive steps to improve his or her situation.

Most communities have emergency help available, often in the form of a hotline telephone counseling service run by a suicide prevention agency. If you feel there is an immediate danger of suicide, do not leave the person alone. Call for help or take him or her to an emergency room.

Firearms are used in more suicides than homicides. Eighty-three percent of gun-related deaths in the home are the result of suicide, often by someone other than the gun owner. If you learn someone at high risk for suicide has access to a gun, try to convince him or her to put it in safekeeping.

MODELS OF HUMAN NATURE AND THERAPEUTIC CHANGE

At least four different perspectives—biological, behavioral, cognitive, and psychodynamic—can be applied to human problems such as the psychological disorders discussed in

this chapter. Each perspective has a distinct view of human nature, and from those views of human nature come distinct therapeutic approaches.

The Biological Model

The *biological model* emphasizes that the mind's activity depends entirely on an organic structure, the brain, whose composition is genetically determined. The activity of neurons, mediated by complex chemical reactions, gives rise to our most complex thoughts, our most ardent desires, and our most pathological behavior. As an organ, the brain responds well to healthy lifestyle behaviors such as a nutritious diet and exercise. (See the box “Does Exercise Improve Mental Health?”) When true mental health issues arise, however, drug therapies can help.

QUICK

STATS

52% of American suicides are committed with guns.

—National Center for Health Statistics, 2012

Pharmacological Therapy The most important kind of therapy inspired by the biological model is pharmacological therapy. A list of some of the popular medications currently used for treating psychological disorders follows. All require a prescription from a psychiatrist or other medical doctor. All have received FDA approval as being safe and more effective than a placebo. However, as with all pharmacological therapies, these drugs may cause side effects. For example, the side effects of widely used antidepressants range from diminished appetite to loss of sexual pleasure. In addition, a patient may have to try several drugs before finding one that is effective and has acceptable side effects.

1. **Antidepressants:** One group is called the selective serotonin reuptake inhibitors (SSRIs) because of one of their actions; this group includes Prozac (fluoxetine),



Pharmacological therapy (medication) is a common form of treatment for many psychological disorders. Medications can be very effective, but they have risks and side effects, and they do not work for all patients.



WELLNESS ON CAMPUS

Deliberate Self-Harm

In general, people want to be well and healthy, protect themselves from harm, and try to make use of the guidance that this book gives. But surprisingly, there are individuals—predominantly in their teens and adolescence—who deliberately harm themselves, although in a nonfatal way. One common method is to cut or burn their skin, leaving scars that may serve as visible representation of emotional pain that they shamefully hide beneath their clothes.

Self-cutting and other self-injurious behaviors are not aesthetically motivated. Many report seeking the physical sensations (including pain) produced by a self-inflicted injury, which may temporarily relieve feelings of tension, perhaps through a release of endorphins.

In 2011 a research group led by Alicia Meuret, an associate professor of psychology at Southern Methodist University, conducted surveys on more than 550 college students and found that over 20% had engaged in self-injury at some point, which is consistent with prevalence estimates in other studies on college populations. In examining differences between self-injurers and non-injurers, individuals that had recently engaged in self-harm were significantly more depressed, anxious, and disgusted with themselves. Compared to non-injurers, self-injurers were roughly 4 times more likely to report a history of physical abuse and 11 times more likely to report a history of sexual abuse.



Self-injury is not the same as a suicide attempt, but individuals who repeatedly hurt themselves are more likely to commit suicide than the general population. In any case, self-injury should be taken seriously. If you do it, talk to a counselor. If someone you know does it, try to convince him or her to talk to a counselor.

Paxil (paroxetine), Zoloft (sertraline), Celexa (citalopram), and Lexapro (escitalopram). Another group is called the tricyclics after their chemical structure; it includes Aventyl (nortriptyline) and Elavil (amitriptyline). Antidepressants that do not fit into these groups include Effexor (venlafaxine), Welbutrin (bupropion), Serzone (nefazodone), Remeron (mirtazapine), and Cymbalta (duloxetine). Surprisingly, these antidepressants are as effective in treating panic disorder and certain kinds of chronic anxiety as they are in treating depression. They may also alleviate the symptoms of OCD.

2. **Mood stabilizers:** Lithium carbonate, Depakote (valproic acid), and Lamictal (lamotrigine) are prescribed as mood stabilizers. They are taken to prevent mood swings that occur in bipolar disorder and certain kinds of schizophrenia.
3. **Antipsychotics:** Older antipsychotics include Haldol (haloperidol) and Prolixin (fluphenazine); newer antipsychotics (sometimes called “atypical”) are Clozaril (clozapine), Zyprexa (olanzapine), Risperdal (risperidone), Seroquel (quetiapine), Abilify (aripiprazole), and Geodon (zisperidone). The drugs reduce hallucinations and disordered thinking in people with schizophrenia, bipolar disorder, and delirium, and they have a calming effect on agitated patients.

4. **Anxiolytics (anxiety agents) and hypnotics (sleeping pills):** One of the largest and most prescribed classes of anxiolytics is the benzodiazepines, a group of drugs that includes Valium (diazepam), Librium (chlordiazepoxide), Xanax (alprazolam), and Ativan (lorazepam); Dalmane (flurazepam), Restoril (temazepam), and Halcion (triazolam) are benzodiazepines marketed as sleeping aids. Newer hypnotics are Sonata (zaleplon), Ambien (zolpidem), and Lunesta (eszopiclone).
5. **Stimulants:** Ritalin (methylphenidate) and Dexedrine (dextroamphetamine) are most commonly used to treat **attention-deficit/hyperactivity disorder (ADHD)** in children and less often in adults. (For another approach to ADHD, see the box “ADHD and Exposure to Nature.”) Drugs of this type are also marketed under the names Adderall, Strattera, Concerta, Focalin, and Metadate. They are also used against daytime sleepiness.

attention-deficit/hyperactivity disorder (ADHD)

A disorder characterized by persistent, pervasive problems with inattention and/or hyperactivity to a degree that is not considered appropriate for a child's developmental stage and that causes significant difficulties in school, work, or relationships.

TERMS

TAKE CHARGE

Does Exercise Improve Mental Health?



Since 1995 more than 30 major population-based studies (involving 175,000 Americans) have been published on the association between physical activity and mental health. The overall conclusion is that exercise—even modest activity such as taking a daily walk—can help combat a variety of mental health problems. For example, studies found that regular physical activity protects against depression and the onset of major depressive disorder; it can also reduce symptoms of depression in otherwise healthy people. Other studies found that physical activity protects against anxiety and the onset of anxiety disorders (such as specific phobia, social phobia, generalized anxiety, and panic disorder); it also helps reduce symptoms in people affected with an anxiety disorder.

Physical activity can enhance feelings of well-being in some people, which may provide some protection against psychological distress. Overall, physically active people are about 25–30% less likely to feel distressed than inactive people. Regardless of the number, age, or health status of the people being studied, those who were active managed stress better than their inactive counterparts.

Researchers have also looked at specific aspects of the activity/stress association. For example, one study found that taking a long walk can be effective at reducing anxiety and blood pressure. Another showed that a brisk walk as short as 10 minutes can leave people feeling more relaxed and energetic for up to two hours.

People who took three brisk 45-minute walks a week for three months reported that they perceived fewer daily hassles and had a greater sense of general wellness.

Physical activity also helps you sleep better, and consistently sound sleep is critical to stress management and mental health. According to the National Sleep Foundation, about two-thirds of Americans have trouble sleeping at least a few nights a week, and 41% say they have difficulty sleeping virtually every night. There are about 70 known sleep disorders, and disordered sleep is associated with a variety of physical and neurological problems, including health problems relating to stress. Although only a few small-scale studies have been done on the relationship between physical activity and sleep, most experts have concluded that regular activity promotes better sleep and provides some protection against sleep interruptions such as insomnia and sleep apnea. Consistent, restful sleep is now regarded as a protective factor in disorders such as depression, anxiety, obesity, and heart disease.

SOURCES: Physical Activity Guidelines Advisory Committee. 2008. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: U.S. Department of Health and Human Services.

in adults, as are purified caffeine (for example, No-Doz) and Provigil (modafinil).

6. **Antidementia drugs:** Dementia is an impairment in memory and thinking that occurs almost exclusively in the elderly. The most common type is Alzheimer's disease (see Chapter 22). Many people with this problem are now prescribed Aricept (donepezil) or Namenda (memantine), although the benefit is often disappointingly small.

Issues in Drug Therapy The discovery that many psychological disorders have a biological basis in disordered brain chemistry has led to a revolution in the treatment of many disorders, particularly depression. The new view of depression as based in brain chemistry has also lessened the stigma attached to the condition, leading more people to seek treatment, and antidepressants are now among the most widely prescribed drugs in the United States. The development of effective drugs has provided relief for many people, but the wide use of antidepressants has also raised many questions. Critics of drug therapy have raised questions about whether the new drugs are really better than the old, or are just being marketed by

drug companies because their patents on old drugs have run out. Critics also say that the efficacy of antidepressants has been exaggerated by drug company-sponsored research, and that psychological treatments of depression are usually just as good.

Research indicates that for mild cases of depression, psychotherapy and antidepressants are about equally effective. For major depression, combined therapy is significantly more effective than either type of treatment alone. Therapy can help provide insight into factors that precipitated the depression, such as high levels of stress or a history of abuse. A therapist can also provide guidance in changing patterns of thinking and behavior that contribute to the problem.

Many psychological disorders have a biological basis in disordered brain chemistry.

The Behavioral Model

The *behavioral model* focuses on what people do—their overt behavior—rather than on brain structures and chemistry or on thoughts and consciousness. This model regards psychological problems as “maladaptive behavior” or bad habits. When and how a person learned maladaptive behavior is less important than what makes it continue in the present.



EMBRACING WELLNESS

ADHD and Exposure to Nature

Attention-deficit/hyperactivity disorder (ADHD)—characterized by impulsivity, hyperactivity, and/or an inability to stay focused—is the most commonly diagnosed mental disorder among American children and adolescents. Children with

ADHD can struggle with conflict and aggression, peer rejection, and academic problems. Up to 7% of American children are affected by some form of ADHD, and about 4% of adults develop symptoms in any given year.

ADHD is commonly treated with the drug methylphenidate (Ritalin), a psychostimulant that has the seemingly paradoxical effect in people with ADHD of improving attention and decreasing distractibility. Although Ritalin is approved by the FDA for the treatment of ADHD, the long-term effects are not known.

In recent years, interest has grown in supplementing drug and behavioral therapy for children with ADHD by exposing them to natural environments. Researchers have found that when children spend time outdoors in natural settings, ADHD symptoms diminish. In one study, children with ADHD took 20-minute walks in a park, a residential neighborhood, and an urban downtown area, and their concentration was measured after each walk. After the nature walk, concentration improved significantly, comparable to the effects of medication. No one suggests that nature exposure should replace medication, and some believe that the positive effects are overstated, but researchers suggest that “doses of nature” may serve as safe, inexpensive complements to other ADHD treatments.

Some experts worry that almost all American children are missing out on nature these days, largely as a result of increased time spent on video games, computers, and TV. The term “nature deficit disorder” has been coined to describe this lack of exposure to the outside world, with associated childhood obesity and

mental health problems like depression and anxiety. A grassroots movement called the No Child Left Inside Coalition has sprung up to get children outside and to teach them environmental responsibility. Many school districts participate in the program, incorporating environmental literacy into their curricula, beginning in elementary school. The U.S. government is also getting involved. In 2009 the No Child Left Inside Act was introduced in Congress, extending funding for environmental education programs in public schools. As part of the U.S. Department of Education’s budget for fiscal year 2011, \$1 billion was included specifically for environmental literacy programs.

Advocates say that, in addition to helping with ADHD, there are other good reasons for encouraging children to spend time outdoors. Today’s children, they contend, may be losing their fundamental connection to nature, possibly resulting in an entire generation of Americans who feel less connected to—and less sympathetic toward—the environment. Given the urgency of global climate change, pollution, species endangerment and extinction, and other environmental issues, experts say, future generations must be environmentally literate and understand their role in protecting the planet—or risk causing more harm for themselves and their own children.

For a detailed discussion of environmental health—how the environment affects you and how you affect the environment—see Chapter 19.

SOURCES: Bennett, L. 2009. *Greening a K–12 Curriculum* (<http://www.ecoliteracy.org/essays/greening-k-12-curriculum>); Education.com. 2010. *Nature Deficit Disorder* (<http://www.education.com/topic/nature-deficit-disorder>); Faber, T. A., and F. E. Kuo. 2009. Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders* 12(5): 402–409; Luov, R. 2005. *Last Child in the Woods*. Chapel Hill, NC: Algonquin.

Behaviorists analyze behavior in terms of **stimulus**, **response**, and **reinforcement**. The essence of behavior therapy is to discover what reinforcements keep an undesirable behavior going and then to try to alter those reinforcements. For example, if people who fear speaking in class (the stimulus) remove themselves from that situation (the response), they experience immediate relief, which acts as reinforcement for future avoidance and escape.

To change their behavior, fearful people are taught to practice **exposure**—to deliberately and repeatedly enter the feared situation and remain in it until their fear begins to abate. A student who is afraid to speak in class might begin his behavioral therapy program by keeping a diary listing each time he makes a contribution to a classroom discussion, how long he speaks, and his anxiety levels before, during, and after speaking. He would then develop concrete but realistic goals for increasing his speaking frequency and contract with himself to reward his successes by spending more time in

activities he finds enjoyable. This approach is much like the general behavior change strategy described in Chapter 1.

Although exposure to the real situation works best, exposure in one’s imagination or through the virtual reality of computer simulation can also be effective. For example, in the case of someone afraid of flying, an imagined scenario would likely be vivid enough to elicit the fear necessary to practice exposure techniques.

stimulus Anything that causes a response.

response A reaction to a stimulus.

reinforcement Increasing the future probability of a response by following it with a reward.

exposure A therapeutic technique for treating fear; the subject learns to come into direct contact with a feared situation.

TERMS



Behavioral therapy can help people overcome many kinds of fears, including that of public speaking.

The Cognitive Model

The *cognitive model* emphasizes the effect of ideas on behavior and feeling. According to this model, behavior results from complicated attitudes, expectations, and motives rather than from simple, immediate reinforcements.

Cognitive therapy tries to expose and identify false ideas that produce feelings such as anxiety and depression. For example, a student afraid of speaking in class may harbor thoughts such as “If I begin to speak, I’ll say something stupid; if I say something stupid, the teacher and my classmates will lose respect for me; then I’ll get a low grade, my classmates will avoid me, and life will be hell.” In cognitive therapy, these ideas will be examined critically. If the student prepares, will he or she really sound stupid? Does every sentence said have to be exactly correct and beautifully delivered, or is that an unrealistic expectation? Will classmates’ opinions be completely transformed by one presentation? Do classmates even care that much? And why does the student care so much about what *they* think? People in cognitive therapy are taught to notice their unrealistic

thoughts and to substitute more realistic ones, and they are advised to repeatedly test their assumptions.

The Psychodynamic Model

The *psychodynamic model* also emphasizes thoughts. Proponents of this model, however, do not believe thoughts can be changed directly because they are fed by other unconscious ideas and impulses. Symptoms are not isolated pieces of behavior but the result of a complex set of wishes and emotions hidden by active defenses (see Table 3.2). In psychodynamic therapy, patients speak as freely as possible in front of the therapist and try to gain an understanding of the basis of their feelings toward the therapist and others. Through this process, patients gain insights that help them overcome their maladaptive patterns. Current therapies of this type tend to focus more on the present (the here and now) than on the past, and the therapist tries to facilitate self-exploration rather than providing explanations.

Evaluating the Models

Ignoring theoretical conflicts among psychological models, therapists have recently developed pragmatic *cognitive-behavioral therapies* that combine effective elements of both models in a single package. For example, the package for treating social anxiety emphasizes exposure as well as changing problematic patterns of thinking. Combined therapies have also been developed for panic disorder, obsessive-compulsive disorder, generalized anxiety disorder, and depression. These packages, involving 10 or more individual or group sessions with a therapist and homework between sessions, have been shown to produce significant improvement.

Drug therapy and cognitive-behavioral therapies are also sometimes combined, especially in the case of depression. For anxiety disorders, both kinds of therapy are equally effective, but the effects of drug therapy last only as long as the drug is being taken, while cognitive-behavioral therapies produce longer-term improvement. For schizophrenia, drug therapy is a must, but a continuing relationship with therapists who give support and advice is also indispensable.

Psychodynamic therapies have been attacked as ineffective and endless. Of course effectiveness is hard to demonstrate for therapies that do not focus on specific symptoms. But common sense tells us that being able to open yourself up and discuss your problems with a supportive but objective person who focuses on you and lets you speak freely can enhance your sense of self and reduce feelings of confusion and despair.

GETTING HELP

Knowing when self-help or professional help is required for mental health problems is usually not as difficult as knowing how to start or which professional to choose.

Self-Help

If you have a personal problem to solve, a smart way to begin is by finding out what you can do on your own. Some problems are specifically addressed in this book. Behavioral and some cognitive approaches are especially useful for helping yourself. They all involve becoming more aware of self-defeating actions and ideas and combating them in some way: by being more assertive; by communicating honestly; by raising your self-esteem by counteracting negative thoughts, people, and actions that undermine it; and by confronting, rather than avoiding, the things you fear. You can get more information from books in the psychology or self-help sections of libraries and bookstores, but be selective. Watch out for self-help books making fantastic claims or deviating from mainstream approaches.

Some people find it helpful to express their feelings in a journal. Grappling with a painful experience in this way provides an emotional release and can help you develop more constructive ways of dealing with similar situations in the future. Research indicates that using a journal this way can improve physical as well as emotional wellness.

For some people, religious belief and practice may promote psychological health. Religious organizations provide a social network and a supportive community, and religious practices, such as prayer and meditation, offer a path for personal change and transformation.

Peer Counseling and Support Groups

Sharing your concerns with others is another helpful way of dealing with psychological health challenges. Just being able to share what's troubling you with an accepting, empathetic person can bring relief. Comparing notes with people who have problems similar to yours can give you new ideas about coping.

Many colleges offer peer counseling through a health center or through the psychology or education department. Peer counseling is usually done by volunteer students who have special training that emphasizes confidentiality. Peer counselors may steer you toward an appropriate campus or community resource or simply offer a sympathetic ear.

Ask Yourself

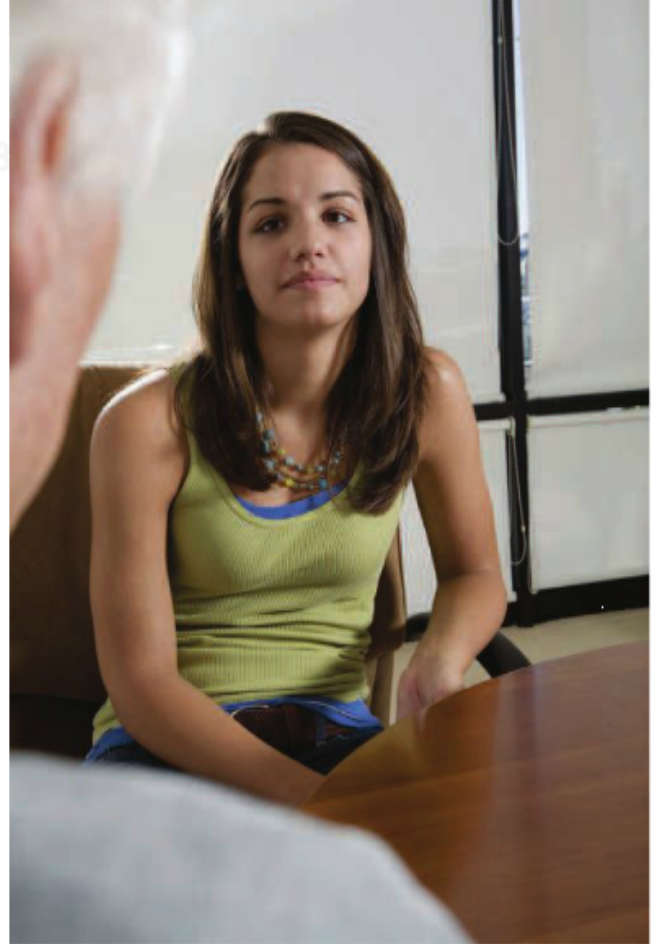
Are you open to discussing the intimate details of your life, your emotions, your fears, your deepest thoughts? Have you ever truly opened up to another person in this manner? Would you be open to this kind of sharing if it meant getting help for a psychological disorder?

QUICK

STATS

22,690
psychiatrists and
100,700
psychologists
were practicing in
the United States
in 2010.

—Bureau of Labor Statistics, 2011



Individual therapy is just one of many different approaches to psychological counseling.

Many self-help groups work on the principle of bringing together people with similar problems to share their experiences and support one another. Support groups are typically organized around a specific problem, such as eating disorders or substance abuse. Self-help groups may be listed in the phone book or the campus newspaper.

Professional Help

Sometimes self-help or talking to nonprofessionals is not enough. More objective, more expert, or more discreet help is needed.

Many people have trouble accepting the need for professional help, and often those who most need help are the most unwilling to get it. You may someday find yourself having to overcome your own reluctance, or that of a friend, about seeking help.

Determining the Need for Professional Help In some cases, professional help is optional. Some people are interested in improving their psychological health in a general way by going into individual or group therapy to learn more about themselves and how to interact with others. Seeking professional help for these reasons is a matter of

CRITICAL CONSUMER

Choosing and Evaluating Mental Health Professionals



College students are usually in a good position to find convenient, affordable mental health care. Larger schools typically have both health services that employ psychiatrists and psychologists and counseling centers staffed by professionals and student peer counselors. Resources in the community may include a school of medicine, a hospital, and a variety of professionals who work independently. Although independent practitioners are listed in the telephone book, it's a good idea to get recommendations from physicians, clergy, friends who have been in therapy, or community agencies rather than pick a name at random.

Financial considerations are also important. Find out how much different services will cost and what your health insurance will cover. If you're not adequately covered by a health plan, don't let that stop you from getting help; investigate low-cost alternatives. City, county, and state governments often support mental health clinics for those who can afford to pay little or nothing for treatment. Some on-campus services may be free or offered at very little cost.

The cost of treatment is linked to how many therapy sessions will be needed, which in turn depends on the type of therapy and the nature of the problem. Psychological therapies focusing on specific problems may require 8–10 sessions at weekly intervals. Therapies aiming for psychological awareness and personal change can last months or years.

Deciding whether a therapist is right for you will require meeting the therapist in person. Before or during your first meeting, find out about the therapist's background and training:

- Does she or he have a degree from an appropriate professional school and a state license to practice?
- Has she or he had experience treating people with problems similar to yours?
- How much will therapy cost?

You have a right to know the answers to these questions and should not hesitate to ask them. After your initial meeting, evaluate your impressions:

- Does the therapist seem like a warm, intelligent person who would be able to help you and seems interested in doing so?
- Are you comfortable with the personality, values, and beliefs of the therapist?
- Is he or she willing to talk about the techniques in use? Do these techniques make sense to you?

If you answer yes to these questions, this therapist may be satisfactory for you. If you feel uncomfortable—and you're not in need of emergency care—it's worthwhile to set up one-time consultations with one or two others before you make up your mind. Take the time to find someone who feels right for you.

Later in your treatment, evaluate your progress:

- Are you being helped by the treatment?
- If you are displeased, is it because you aren't making progress, or because therapy is raising difficult, painful issues you don't want to deal with?
- Can you express dissatisfaction to your therapist? Such feedback can improve your treatment.

If you're convinced your therapy isn't working or is harmful, thank your therapist for her or his efforts, and find another.

connect
ACTIVITY
DO IT ONLINE

individual choice. In some situations, such as friction among family members or between partners, professional help can mean the difference between a painful divorce and a satisfying relationship.

Professional help is appropriate in any of the following situations:

- Depression, anxiety, or other emotional problems interfere seriously with school or work performance or in getting along with others.
- Suicide is attempted or is seriously considered (see the warning signs listed earlier in the chapter).
- Symptoms such as hallucinations, delusions, incoherent speech, or loss of memory occur.
- Alcohol or drugs are used to the extent that they impair normal functioning during much of the week, finding or taking drugs occupies much of the week, or reducing

their dosage leads to psychological or physiological withdrawal symptoms.

Choosing a Mental Health Professional Mental health workers belong to several different professions and have different roles. Psychiatrists are medical doctors. They are experts in deciding whether a medical disease lies behind psychological symptoms, and they are usually involved in treatment if medication or hospitalization is required. Clinical psychologists typically hold a PhD degree; they are often experts in behavioral and cognitive therapies. Other mental health workers include social workers, licensed counselors, and clergy with special training in pastoral counseling. In hospitals and clinics, various mental health professionals may join together in treatment teams.

For more on finding appropriate help, see the box "Choosing and Evaluating Mental Health Professionals."

TIPS FOR TODAY AND THE FUTURE

Most of life's psychological challenges can be met with self-help and everyday skills. You can take many steps to maintain your mental health.

RIGHT NOW YOU CAN:

- Take a serious look at how you've been feeling recently. If you have any feelings that are especially hard to handle, consider how you can get help with them.
- Think of the way in which you are most creative (an important part of self-actualization), whether it's in music, art, or whatever you enjoy. Try to focus at least an hour each week on this activity.
- Review the list of defense mechanisms in Table 3.2. Have you used any of them recently or consistently over time? Think of a situation in which you used one of those mechanisms and determine how you could have coped with it differently.

IN THE FUTURE YOU CAN:

- Write 100 positive adjectives that describe you. This exercise may take several days to complete. Post your list in a place where you will see it often.
- Record your reactions to upsetting events in your life. Are your reactions and self-talk typically negative or neutral? Decide whether you are satisfied with your reactions and if they are healthy.

Connect to Your Choices

Have you ever thought about why you approach emotional and psychological problems the way you do? Many factors can influence the choices we make about psychological health, some not as obvious as others. Do you hold in your feelings and hide them from others because that's what was modeled in your family? Do you drink or use drugs when you feel depressed or anxious because you aren't aware of any other options? Do you think getting professional help for a psychological problem is a sign that you're weak or crazy?

What are the external factors that influence your choices about psychological health? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

SUMMARY

- Psychological health encompasses more than a single particular state of normality. Psychological diversity is valuable among groups of people.
- Defining psychological health as the presence of wellness means that to be healthy you must strive to fulfill your potential.
- Maslow's definition of psychological health centers on self-actualization, the highest level in his hierarchy of needs. Self-actualized people have high self-esteem and are realistic, inner-directed, authentic, capable of emotional intimacy, and creative.
- Crucial parts of psychological wellness include developing an adult identity, establishing intimate relationships, and developing values and purpose in life.
- A sense of self-esteem develops during childhood as a result of giving and receiving love and learning to accomplish goals. Self-concept is challenged every day; healthy people adjust their goals to their abilities.
- Using defense mechanisms to cope with problems can make finding solutions harder. Analyzing thoughts and behavior can help people develop less defensive and more effective ways of coping.
- A pessimistic outlook can be damaging; it can be overcome by developing more realistic self-talk.
- Honest communication requires recognizing what needs to be said and saying it clearly. Assertiveness enables people to insist on their rights and to participate in the give-and-take of good communication.
- People may be lonely if they haven't developed ways to be happy on their own or if they interpret being alone as a sign of rejection. Lonely people can take action to expand their social contacts.
- Dealing successfully with anger involves distinguishing between a reasonable level of assertiveness and gratuitous expressions of anger, heading off rage by reframing thoughts and distracting oneself, and responding to the anger of others with an asymmetrical, problem-solving orientation.
- People with psychological disorders have symptoms severe enough to interfere with daily living.
- Anxiety is a fear that is not directed toward any definite threat. Anxiety disorders include simple phobias, social phobias, panic disorder, generalized anxiety disorder, obsessive-compulsive disorder, and posttraumatic stress disorder.
- Depression is a common mood disorder; loss of interest or pleasure in things seems to be its most universal symptom. Severe depression carries a high risk of suicide, and suicidally depressed people need professional help.
- Symptoms of mania include exalted moods with unrealistically high self-esteem, little need for sleep, and rapid speech. Mood swings between mania and depression characterize bipolar disorder.

- Schizophrenia is characterized by disorganized thoughts, inappropriate emotions, delusions, auditory hallucinations, and deteriorating social and work performance.
- The biological model emphasizes that the mind's activity depends on the brain, whose composition is genetically determined. Therapy based on the biological model is primarily pharmacological.
- The behavioral model focuses on overt behavior and treats psychological problems as bad habits. Behavior change is the focus of therapy.
- The cognitive model considers how ideas affect behavior and feelings; behavior results from complicated attitudes, expectations, and motives, not just from simple reinforcements. Cognitive therapy focuses on changing a person's thinking.
- The psychodynamic model asserts that false ideas are fed by unconscious ideas and cannot be addressed directly. Treatment is based on psychotherapy.
- Help is available in a variety of forms, including self-help, peer counseling, support groups, and therapy with a mental health professional. For serious problems, professional help may be the most appropriate.

FOR MORE INFORMATION

BOOKS

Antony, M. M., and R. P. Swinson. 2008. *The Shyness & Social Anxiety Workbook: Proven, Step-by-Step Techniques for Overcoming Your Fear*, 2nd ed. Oakland, CA: New Harbinger. Practical suggestions for fears of interacting with people you don't know.

Grieco, R., and L. Edwards. 2009. *The Other Depression: Bipolar Disorder*. New York: Routledge. Provides a complete introduction to bipolar disorder, its symptoms, and its current treatments.

Jenkins, J., D. Keltner, and K. Oatley. 2006. *Understanding Emotions*, 2nd ed. Oxford: Blackwell. A comprehensive guide to emotions, including current research on the neuroscience of emotions, evolutionary and cultural approaches to emotion, and the expression and communication of emotions.

Leahy, R. L. 2010. *Beating the Blues Before They Beat You: How to Overcome Depression*. New York: Hay House. Describes strategies from cognitive behavioral therapy for changing thinking patterns that contribute to low self-esteem and depression; outlines symptoms, causes, and treatments, including therapy and medication.

Nathan, P. E., and J. M. Gorman. 2007. *A Guide to Treatments That Work*, 3rd ed. New York: Oxford University Press. A balanced and comprehensive report on various treatments for psychological disorders.

Seligman, M. E. 2012. *Flourish: A Visionary New Understanding of Happiness and Well-Being*. New York: Free Press. The author refines his ideas about learned optimism and happiness, identifying factors that contribute to a satisfying life: positive emotion, engagement, relationships, meaning, and accomplishment.

ORGANIZATIONS, HOTLINES, AND WEBSITES

American Association of Suicidology. Provides information about suicide and resources for people in crisis.
<http://www.suicidology.org>

Anxiety Disorders Association of America (ADAA). Provides information and resources related to anxiety disorders.

<http://www.adaa.org>

Cope, Care, Deal. Offers information on mental health issues specifically for teens.

<http://www.copecaredeal.org>

Depression and Bipolar Support Alliance (DBSA). Provides educational materials and information about support groups.

<http://www.dbsalliance.org>

Mental Health America. Provides consumer information on a variety of issues, including how to find help.

<http://www.nmha.org>

NAMI (National Alliance on Mental Illness). Provides information and support for people affected by mental illness.

800-950-NAMI (help line)

<http://www.nami.org>

National Hopeline Network. 24-hour hotline for people who are thinking about suicide or know someone who is; calls are routed to local crisis centers.

800-SUICIDE

<http://www.hopeline.com>

National Institute of Mental Health (NIMH). Provides helpful information about anxiety, depression, eating disorders, and other challenges to psychological health.

<http://www.nimh.nih.gov>

Substance Abuse and Mental Health Services Administration. A one-stop source for information and resources relating to mental health.

<http://samhsa.gov>

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BEHAVIOR CHANGE STRATEGY

Dealing with Social Anxiety

Shyness is often the result of both high anxiety levels and lack of key social skills. To help overcome shyness, you need to learn to manage your fear of social situations and to develop social skills such as appropriate eye contact, initiating topics in conversations, and maintaining the flow of conversations by asking questions and making appropriate responses.

As described in the chapter, repeated *exposure* to the source of one's fear—in this case social situations—is the best method for reducing anxiety. When you practice new behaviors, they gradually become easier and you experience less anxiety.

A counterproductive strategy is avoiding situations that make you anxious. Although this approach works in the short term—you eliminate your anxiety because you escape the situation—it keeps you from meeting new people and having new experiences. Another counterproductive strategy is self-medicating with alcohol or drugs. Being under their influence actually prevents you from learning new social skills and new ways to handle your anxiety.

To reduce your anxiety in social situations, try some of the following strategies:

- Remember that physical stress reactions are short-term responses to fear. Don't dwell on them. Remind yourself that they will pass, and they will.
- Refocus your attention away from the stress reaction you're experiencing and toward the social task at hand. Your nervousness is much less visible than you think.
- Allow a warm-up period for new situations. Realize that you will feel more nervous at first, and take steps to relax and become more comfortable. Refer to the suggestions for deep breathing and other relaxation techniques in Chapter 2.
- If possible, take breaks during anxiety-producing situations. For example, if you're at a party, take a moment to visit the restroom or step outside. Alternate between speaking with good friends and striking up conversations with new acquaintances.

- Watch your interpretations. Having a stress reaction doesn't mean that you don't belong in the group, that you're unattractive or unworthy, or that the situation is too much for you. Try thinking of yourself as excited or highly alert instead of anxious.
- Avoid cognitive distortions and practice realistic self-talk. Replace your self-critical thoughts with more supportive ones: "No one else is perfect, and I don't have to be either." "It would have been good if I had a funny story to tell, but the conversation was interesting anyway."
- Give yourself a reality check: Ask if you're really in a life-threatening situation (or just at a party), if the outcome you're imagining is really likely (or the worst thing that could possibly happen), or if you're the only one who feels nervous (or if many other people might feel the same way).
- Don't think of conversations as evaluations. Remind yourself that you don't have to prove yourself with every social interaction. And remember that most people are thinking more about themselves than they are about you.

Starting and maintaining conversations can be difficult for shy people, who may feel overwhelmed by their physical stress reaction. If small talk is a problem for you, try the following strategies:

- Introduce yourself early in the conversation. If you tend to forget names, repeat your new acquaintance's name to help fix it in your mind ("Nice to meet you, Amelia").
- Ask questions and look for shared topics of interest. Simple, open-ended questions like "How's your presentation coming along?" or "How do you know our host?" encourage others to carry the conversation for a while and help bring up a variety of subjects.
- Take turns talking, and elaborate on your answers. Simple yes and no answers don't move the conversation along. Try to relate something in your

life—a course you're taking or a hobby you have—to something in the other person's life. Match self-disclosure with self-disclosure.

- Have something to say. Expand your mind and become knowledgeable about current events and local or campus news. If you have specialized knowledge about a topic, practice discussing it in ways that both beginners and experts can understand and appreciate.
- If you get stuck for something to say, try giving a compliment ("Great presentation!" or "I love your earrings.") or performing a social grace (pass the chips or get someone a drink).
- Be an active listener. Reward the other person with your full attention and with regular responses. Make frequent eye contact and maintain a relaxed but alert posture. (See Chapter 4 for more on being an active listener.)

At first, your new behaviors will likely make you anxious. Don't give up—things *will* get easier.



SOURCES: University of Texas at Dallas, Student Counseling Center. 2008 Update. *Self-Help: Overcoming Social Anxiety* (<http://www.utdallas.edu/counseling/selfhelp/social-anxiety.html>); Carducci, B. J. 2000. *Shyness: A Bold New Approach*. New York: Harper Paperbacks.

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Intimate Relationships and Communication

LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain the qualities that help people develop intimate relationships
- Describe different types of love relationships and the stages they often go through
- Identify common challenges of forming and maintaining intimate relationships
- Explain some elements of healthy and productive communication
- List some characteristics of successful families and some potential problems families face

TEST YOUR KNOWLEDGE

1. Over time, the average American's circle of close friends has gotten significantly larger.
True or false?
2. In a typical long-term intimate relationship, commitment tends to increase over time.
True or false?
3. Jealousy is a good indicator of what?
 - a. Love
 - b. Insecurity
 - c. Passion
4. What percentage of American children live in single-parent homes?
 - a. .27%
 - b. 2.7%
 - c. 27%

ANSWERS

1. **FALSE.** Most Americans now have only two friends they consider close enough to confide in. The average American's circle of close friends has steadily shrunk over the last two decades.
2. **TRUE.** Although passion and physical attraction tend to decline over time, most couples become increasingly committed to their relationships as time goes by.
3. **B.** Some people think that the existence of jealousy proves the existence of love, but jealousy is actually a more accurate yardstick for measuring insecurity or possessiveness. Jealousy can destroy a relationship.
4. **C.** According to the U.S. Census Bureau, about 27% of American children lived with single parents in 2011. Of all American children living in single-parent homes, 87% lived with their mother and 13% lived with their father.

Human beings need social relationships; we cannot thrive as solitary creatures. The human species could not survive if adults didn't cherish and support each other, if we didn't form strong mutual attachments with our infants, and if we didn't create families in which to raise children. Simply put, people need people.

Although people are held together in relationships by a variety of factors, the foundation of many relationships is the ability to both give and receive love. Love in its many forms—romantic, passionate, platonic, parental—is the wellspring from which much of life's meaning and delight flows. In our culture, it binds us together as partners, parents, children, and friends.

Just as important, we also need to develop a healthy relationship to ourselves, which includes the ability to self-soothe, to regulate our emotions, and to be alone with ourselves at times.

DEVELOPING INTIMATE RELATIONSHIPS

People who develop successful intimate relationships believe in themselves and in the people around them. They are willing to give of themselves—to share their ideas, feelings, time, and needs—and to accept what others want to give them.

Self-Concept, Self-Esteem, and Self-Acceptance

The principal element that we all bring to our relationships is our *selves*. To have successful relationships, we must first accept and feel good about ourselves. A positive self-concept and a healthy level of self-esteem help us love and respect others.

As discussed in Chapter 3, the roots of our identity and sense of self can be found in childhood, in the relationships we had with our parents and other family members. As adults, we are more likely to have a sense that we're basically lovable, worthwhile people and that we can trust others if we experienced the following as babies and children:

- We felt loved, valued, accepted, and respected.
- Adults responded to our needs in appropriate ways.
- Adults gave us the freedom to play, explore, and develop a sense of being separate individuals.

These conditions encourage us to develop the sense that we are acceptable and lovable, and help us build a basic confidence that aids in navigating life's inevitable challenges. Successfully handling these challenges further bolsters self-acceptance, self-concept, and self-esteem.

Gender Role Another thing we learn in early childhood is *gender role*—the activities, abilities, and characteristics our culture deems appropriate for us based on our sex. In our society, men have traditionally been expected to provide for their families; to be aggressive, competitive, and power-oriented; and to solve problems logically. Women have been expected to take care of home and children; to be cooperative, supportive, and nurturing; and to approach life emotionally and intuitively. More egalitarian gender roles have emerged in our society, but the stereotypes we absorb in childhood can be deeply ingrained.

Attachment Our ways of relating to others are also rooted in childhood. Some researchers have suggested that our adult styles of loving may be based on the type of **attachment** we established in infancy with our mother, father, siblings, or other primary caregivers. According to this view, people who are secure in their intimate relationships probably had a secure, trusting, mutually satisfying attachment to their mother, father, or other parenting figure. As adults, they find it relatively easy to get close to others. They don't worry about being abandoned or having someone get too close to them. They feel that other people like them and are generally well-intentioned.

People who are clinging and dependent in their relationships may have had an "anxious/ambivalent" attachment. Their parents' inconsistent responses made them unsure that their needs would be met. As adults, they worry whether their partners really love them and will stay with them. They tend to feel that others don't want to get as close as they do. They want to merge completely with another person, which can scare others away.

People who seem to run from relationships may have had an "anxious/avoidant" attachment, in which a parent's engulfing or abandoning responses made them want to escape

from his or her sphere of influence. As adults, they feel uncomfortable being close to others. They're distrustful and fearful of becoming dependent. Their partners usually want more intimacy than they do.

Even if people's earliest experiences and relationships were less than ideal, however, they can still establish satisfying relationships in adulthood. In fact, relationships in adolescence and adulthood give us a golden opportunity to work on and through unresolved issues and conflicts from the past.

People can be resilient and flexible. They have the capacity to change their ideas, beliefs, and behaviors. They can learn ways to raise their self-esteem; they can become more trusting, accepting, and appreciative of others; and they can acquire the communication and conflict resolution skills required for maintaining successful relationships. Although it helps to have a good start in life, it may be even more important to begin again, right from where you are. Most important is to be accepting and kind to ourselves as we are in the present and do our best to grow and develop emotionally.

Friendship

Friendships are the first relationships we form outside the family. The friendships we form in childhood are an important part of our development. Through them, we learn about tolerance, sharing, and trust. Friendships usually include most or all of the following characteristics:

- **Companionship.** Friends are usually relaxed and happy when they're together. They typically have common values and interests and plan to spend time together. But real friends can also be tense and unhappy with each other. Unlike fair-weather friends, we need to be able to support others as we would want them to support us, even on bad days.
- **Respect.** Friends have a basic respect for each other's humanity and individuality. Good friends respect each other's feelings and opinions and work to resolve their differences without demeaning or insulting each other. They also show their respect by being honest.
- **Acceptance.** Friends accept each other, "warts and all." They feel free to be themselves and express their feelings without fear of ridicule or criticism.
- **Help.** Sharing time, energy, and even material goods is important to friendship. Friends know they can rely on each other in times of need.
- **Trust.** Friends are secure in the knowledge that they will not intentionally hurt each other. They feel safe confiding in one another.
- **Loyalty.** Friends can count on one another. They stand up for each other in both word and deed.
- **Mutuality.** Friends retain their individual identities, but close friendships are characterized by a sense of mutuality—"what affects you affects me." Friends share the ups and downs in each other's lives.

attachment The emotional tie between an infant and his or her caregiver or between two people in an intimate relationship.

TERMS



The type and strength of our attachment to our parents can affect other relationships throughout our lives.

- **Reciprocity.** Friendships are reciprocal. There is give-and-take between friends and the feeling that both share joys and burdens more or less equally over time.

Intimate partnerships are like friendships in many ways, but they have additional characteristics. These relationships usually include sexual desire and expression, a greater demand for exclusiveness, and deeper levels of caring. Friendships are usually considered both more stable and longer-lasting than intimate partnerships. Friends are often more accepting and less critical than lovers, probably because their expectations are different. Like love relationships, friendships bind society together, providing people with emotional support and buffering them from stress.

As important as friendships are, however, the average American's social circle is shrinking. In 2006 sociologists

from Duke University and the University of Arizona released details of a study on this issue. According to the study, Americans have fewer close friends than ever before. Most have only two friends they consider close enough to discuss problems with. (Compare this number to 1985, when the average American had three confidants.) The study suggested several reasons for shrinking social circles, but focused on the increasing use of technology as a means of communicating with one's friends. The growing use of the Internet, texting, and other electronic means of communication let people share information quickly and at any time, but the study's authors worried that digital communications actually create space between friends by allowing them to communicate without being in one another's presence.

A study released in 2009 by the Pew Internet and American Life Project verified this decline in the size of many Americans' core networks, but it differed from the 2006 study in one important respect. That is, the Pew study refuted the assumption that our social circles are shrinking because of our increasing use of technology. Many relationship experts contend that the rising use of the Internet and cell phones has resulted in less person-to-person interaction, and that this is a primary reason for the falling numbers of confidants. The Pew study shows, however, that among demographically similar people, those who use technology to communicate do not have fewer close friends than those who don't use the Internet or a cell phone. On the contrary, the study found that

technology users had larger and more diverse core discussion networks and were just as involved in their communities as people who do not communicate via the Internet or a cell phone.

QUICK STATS

6% of Americans feel that they have no one "especially significant" in their lives.

—Pew Internet & American Life Project, 2009

Love, Sex, and Intimacy

Love is one of the most basic and profound human emotions. It is a powerful force in all our intimate relationships. Love encompasses opposites: affection and anger, excitement and boredom, stability and change, bonds and freedom. Love does not give us perfect happiness, but it does give our lives meaning.

In many kinds of adult relationships, love is closely intertwined with sexuality. In the past, marriage was considered the only acceptable context for sexual activities, but for many people today, sex is legitimized by love. Many couples, heterosexual and

homosexual, live together in committed relationships. We now use personal standards rather than social norms to make decisions about sex—but those norms are slowly changing. In a 2009 Gallup Poll, 57% of Americans said it is morally acceptable for unmarried couples to have sex, and nearly one-half of Americans agreed that unmarried couples who live together for five years are just as committed to their relationship as couples who have been married for the same amount of time.

Many people, however, worry about this trend toward personal responsibility and the bypassing of traditional norms and values. They fear that the prevailing attitude about sexuality has resulted in a greater emphasis on sex over love and a permissiveness that has undermined the commitment needed to make a true loving relationship work. This casual attitude toward sex may also make it easier for people to sexualize their dependency needs.

For most people, love, sex, and commitment are closely linked ideals in intimate relationships. Love reflects the positive factors that draw people together and sustain them in a relationship. It includes trust, caring, respect, loyalty, interest in the other, and concern for the other's well-being. Sex brings excitement and passion to the relationship. It intensifies the relationship and adds fascination and pleasure.

Commitment, the determination to continue, reflects the stable factors that help maintain the relationship. Responsibility, reliability, and faithfulness are characteristics of commitment. Although love, sex, and commitment are related, they are not necessarily connected. One can exist without the others. Despite the various “faces” of love, sex, and commitment, most of us long for a special relationship that contains them all.

Other elements can be identified as features of love, such as euphoria, preoccupation with the loved one, idealization or devaluation of the loved one, and so on, but these tend to be temporary. These characteristics may include **infatuation**, which will fade or deepen into something more substantial. As relationships progress, the central aspects of love and commitment take on more importance.

Men and women tend to have different views of the relationship between love (intimacy) and sex (passion). Numerous studies have found that men can separate love from sex rather easily, although many men find that their most erotic sexual experiences occur in the context of a love relationship. Women generally view sex from the point of view of a relationship. Some people believe you can have satisfying sex without love—with friends, acquaintances, or strangers. Although sex with love is an important norm in our culture, it is frequently disregarded in practice, as the high incidence of extra-relational affairs attests.

The Pleasure and Pain of Love The experience of intense love has confused and tormented lovers throughout history. They live in a tumultuous state of excitement, subject

to wildly fluctuating feelings of joy and despair. They lose their appetite, can't sleep, and can think of nothing but the loved one. Is this happiness? Misery? Both?

The contradictory nature of passionate love can be understood by recognizing that human emotions have two components: physiological arousal and an emotional explanation for the arousal. Love is just one of many emotions accompanied by physiological arousal. Many unpleasant emotions can also generate arousal, such as fear, rejection, frustration, and challenge. Although experiences like attraction and sexual desire are pleasant, extreme excitement is similar to fear and can be unpleasant. For this reason, passionate love may be too intense for some people to enjoy. Over time, the physical intensity and excitement tend to diminish. When this happens, pleasure may actually increase.

The Transformation of Love All human relationships change over time, and love relationships are no exception. At first love is likely to be characterized by high levels of passion and rapidly increasing intimacy. After a while passion decreases as we become habituated to it and to the person. The



Although passion and physical intimacy often decline with time, other aspects of a relationship—such as commitment—tend to grow as the relationship matures.

Infatuation An idealizing, obsessive attraction, characterized by a high degree of physical arousal.

TERMS

diminishing of romance or passionate love is often experienced as a crisis in a relationship. If a more lasting love fails to emerge, the relationship will likely break up.

Unlike passion, however, commitment does not necessarily diminish over time. When intensity diminishes, partners often discover a more enduring love. They can now move from absorption in each other to a relationship that includes external goals and projects, friends, and family. In this kind of intimate, more secure love, satisfaction comes not just from the relationship itself but also from achieving other creative goals, such as work or child rearing. The key to successful relationships is in transforming passion into an intimate love based on closeness, caring, and the promise of a shared future.

Challenges in Relationships

Many people believe that love naturally makes an intimate relationship easy to begin and maintain, but in fact obstacles arise and challenges occur. Even in the best of circumstances, a loving relationship will be tested. Partners enter a relationship with diverse needs and wants, some of which emerge only at times of change or stress. Common relationship challenges relate to self-disclosure, commitment, expectations, competitiveness, and jealousy.

Are There Important Opportunities in Our Relationships?

Obviously we have relationships for fun, companionship, children, and support. But are those all there is to it? Is there hidden meaning in our intimate relationships? Do they repeat issues and conflicts from our past—or offer a way to heal and grow beyond these early-life difficulties? Some experts contend that, as adults, we unconsciously recreate relationships with others that replay the dramas of childhood. In doing so, they say, we attempt to work through and master problems from the past.

At various points in our lives, we may unconsciously play the part of our younger selves—or the part of another person (such as a parent or a sibling)—with the new emotional figure in our lives. We play these roles in the hope of getting emotionally what we didn't get as children or of giving back what we did get.

Conflicts in our later-life relationships often have to do with our feelings and needs. We tend to expect too much, offer too little, or simply feel confused when it comes to our and the other's emotions. Problems in relationships don't always signal incompatibility. Sometimes they may arise from issues that are emotionally difficult because of past frustrations or hurt. The good news is that problems in relationships are a potential path to growth, as individuals and as a couple. A man who feels he doesn't receive enough love from his partner (and didn't from his parents) may benefit from cultivating additional platonic relationships rather than hoping for complete satisfaction from one person. A woman who feels the need for more independence in a relationship (which

she didn't have growing up) may grow from learning to stay with her discomfort around intimacy and see if she is gradually able to tolerate more closeness without becoming frightened or pulling back.

Ultimately it seems that the healthiest relationships are those that allow us to be securely connected at times and then to be just as securely apart at other times. Developmental psychology suggests that the healthiest infants can be comforted by their mothers without feeling overwhelmed and can be apart from their mothers without feeling abandoned. Most important seems to be how strongly a mother is “in tune” with her child, so she can intuitively know when to comfort and when to let go.

Relationships in which we can be open, expressive, and understood offer us the greatest chance to grow, develop our potential, and awaken to as much of life as possible. Perhaps the larger, hidden meaning of relationships is to help us cultivate the intimacy or freedom that may have been in short supply while we were growing up. We can help ourselves and others heal and grow by offering and asking for love and compassion. We can free ourselves from the limits imposed on us from the past by challenging ourselves to see where we are afraid to go in our relationships, and then going there with our partners.

Honesty and Openness Everyone looks for honesty and openness in an intimate relationship. However, especially at the beginning of a relationship, partners tend to engage in a certain amount of pretense in an effort to present themselves in the best possible manner. It's usually best to be yourself from the start to give both you and your potential partner a chance to find out if you are comfortable with each other's beliefs, interests, and lifestyles.

Getting close to another person by sharing thoughts and feelings is emotionally risky, but it is necessary for a relationship to deepen. Take your time, and self-disclose at a slow but steady rate—one that doesn't make you feel too vulnerable or your partner too uncomfortable. Over time, you and your partner will learn more about each other and feel more comfortable sharing. In fact, intimate familiarity with your partner's life is a key characteristic of successful long-term relationships.

Emotional Intelligence Our level of emotional intelligence, a concept that was discussed briefly in Chapter 3, can have a strong impact on the nature and depth of our relationships. An emotionally intelligent person is more able to both give and receive the type of emotional support that many long for in a romantic partner. Luckily for all of us, emotional intelligence is not a fixed entity and can be practiced and developed.

The key to developing emotional intelligence lies in cultivating the overarching skill of mindfulness—the ability to dispassionately observe thoughts and feelings as they occur. When we are able to note and observe emotions without

The healthiest relationships allow us to be **securely connected at times and securely apart at other times.**

ASSESS YOURSELF

Are You Emotionally Intelligent?



Below are the behavioral habits of emotional intelligence. As you read these, rate yourself on each habit. Is this a habit behavior which you practice:

always?	usually?	sometimes?	seldom?	almost never?
5 points	4 points	3 points	2 points	1 points

Behavioral habit	Score
1. In call circumstances I respect other people and their feelings	
2. I can easily identify my feelings	
3. I take responsibility for own emotions	
4. I can maintain control of my emotions	
5. I find it easy to validate other's feelings and values	
6. I do not rush to judge or label other people and situations	
7. I do not try to manipulate, criticize, blame or overpower others	
8. I constantly challenge my habitual responses, and am willing to try considered alternatives	
9. I live in the present, learn from experiences, and do not carry negative feelings forward	

Scoring:

40–45 = High level of emotional maturity, awareness and control. You have a positive and inspiring impact on others.

35–39 = Higher than average level of emotional intelligence. Concentrate on self-awareness and control, and developing increased empathy for others.

27–35 = You have a base line awareness of what emotional intelligence is. Be alert for opportunities to increase levels of self-awareness and empathy toward others, and to refine responses.

9–26 = Now that you're aware of emotional intelligence, monitor your emotions and their impact on you and others. Notice how your behavior impact others and get feedback on how to modify behavior which has negative affect.

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judging them or immediately acting on them, we can make more measured, wise, and skillful responses to the situation at hand. These skills can be particularly helpful when we are involved in an argument or a conflict with someone with whom we have a close personal relationship.

Mindfulness can be cultivated by paying more attention to the operation of our minds, slowing down our lives enough to make more detailed observations, and staying in the moment as we go about our day-to-day activities. Although we often have limited control over external events, we have a great deal of ability to discipline, focus, and train our minds. Practicing mindfulness and developing emotional intelligence will improve your sense of self and the quality of your relationships, and may even result in the peace of mind that many people find so elusive. (To rate your current level of emotional intelligence, see the box “Are You Emotionally Intelligent?”)

Unequal or Premature Commitment Sometimes one person in an intimate partnership becomes more serious about the relationship than the other partner. In this situation, it can

be difficult to maintain the partnership without hurting the more serious partner. Sometimes a couple makes a premature commitment, and then one of the partners has second thoughts and wants to break off the relationship. Sometimes both partners begin to realize that something is wrong, but each is afraid to tell the other. Such problems usually can be resolved only by honest and sensitive communication.

Unrealistic Expectations Each partner brings hopes and expectations to a relationship, some of which may be unrealistic, unfair, and ultimately damaging to the relationship. For example, if you believe that love will eliminate all of your problems, you may start to blame your partner for anything that goes wrong in your life. Other unrealistic expectations include the following:

- *Expecting your partner to change.* Your partner probably has certain characteristics that you like, and others you don't like. It's OK to discuss them with your partner, but it's unfair to demand that your partner change to meet all of your

expectations. Accept the differences between your ideal and reality.

- *Assuming that your partner has all the same opinions, priorities, interests, and goals as you.* Don't assume that you think or feel the same way about everything—or that you must if the relationship is to succeed. Agreement on key issues (such as whether to have children) is important, but differences can enhance a relationship as long as partners understand and respect each other's points of view.

- *Believing that a relationship will fulfill all of your personal, financial, intellectual, and social needs.* Expecting a relationship to fulfill all your needs places too much pressure on your partner and on your relationship, and it will inevitably lead to disappointment. For your own well-being, it's important to maintain some degree of autonomy and self-sufficiency.

Competitiveness Games and competitive sports add flavor to the bonding process—as long as the focus is on fun. If one partner always feels compelled to compete and win, it can detract from the sense of connectedness, interdependence, equality, and mutuality between partners. The same can be said for a perfectionistic need to be right in every instance—to “win” every argument.

If competitiveness is a problem for you, ask yourself if your need to win is more important than your partner's feelings or the future of your relationship. Try noncompetitive activities or an activity where you are a beginner and your partner excels. Accept that your partner's views may be just as valid and important to your partner as your own views are to you.

Balancing Time Together and Apart You may enjoy time together with your partner, but you may also want to spend time alone or with other friends. If you or your partner interpret time apart as rejection or lack of commitment, it can damage the relationship. Talk with your partner about what time apart means and share your feelings about what you expect from the relationship in terms of time together. Consider your partner's feelings carefully, and try to reach a compromise that satisfies both of you.

Differences in expectations about time spent together can mirror differences in ideas about emotional closeness. Any romantic relationship involves giving up some degree of autonomy in order to develop an identity as a couple. But remember that every person is unique and has different needs for distance and closeness in a relationship.

Jealousy Jealousy is the angry, painful response to a partner's real, imagined, or likely involvement with a third person. Some people think that the existence of jealousy proves the existence of love, but jealousy is actually a sign of insecurity or possessiveness.

In its irrational and extreme forms, jealousy can destroy a relationship by its insistent demands and attempts at control. Jealousy is a factor in precipitating violence in dating relationships among both high school and college students, and abu-



Supportiveness is a sign of commitment and compassion and is an important part of any healthy relationship.

sive spouses often use jealousy to justify their violence. (Problems with control and violence in relationships are discussed in Chapter 21.)

People with a healthy level of self-esteem are less likely to feel jealous. When jealousy occurs in a relationship, it's important for the partners to communicate clearly with each other about their feelings.

Supportiveness Another key to successful relationships is the ability to ask for and give support. Partners need to know that they can count on each other during difficult times.

Unhealthy Relationships

Everyone should be able to recognize when a relationship is unhealthy. Relatively extreme examples of unhealthy relationships are those that are physically or emotionally abusive or that involve codependency.

Even relationships that are not abusive or codependent can still be unhealthy. If your relationship lacks love and respect and places little value on the time you and your partner have spent together, it may be time to get professional help or

to end the partnership. Further, if your relationship is characterized by communication styles that include criticism, contempt, defensiveness, and withdrawal—despite real efforts to repair these destructive patterns—the relationship may not be salvageable. Consider these questions:

- Do you and your partner have more negative than positive experiences and interactions?
- Are there old hurts that you or your partner cannot forgive?
- Do you feel disrespected or unloved?
- Do you find it hard to feel positive feelings of affection for your partner?
- Does it feel as if your relationship has been a waste of time?

Spiritual leaders suggest that relationships are unhealthy when you feel that your sense of spontaneity, your potential for inner growth and joy, and your connection to your spiritual life is deadened. There are negative physical and mental consequences of being in an unhappy relationship. Although breaking up is painful and difficult, it is ultimately better than living in a toxic relationship.

Ending a Relationship

Even when a couple starts out with the best of intentions, an intimate relationship may not last. Some breakups occur quickly following direct action by one or both partners, but many others occur over an extended period as the couple goes through a cycle of separating and reconciling.

Ending an intimate relationship is usually difficult and painful. Both partners may feel attacked and abandoned, but feelings of distress are likely to be more acute for the rejected partner. If you are involved in a breakup, the following suggestions may help make the ending easier:

- *Give the relationship a fair chance before breaking up.* If it's still not working, you'll know you did everything you could.
- *Be fair and honest.* If you're initiating the breakup, don't try to make your partner feel responsible.
- *Be tactful and compassionate.* You can leave the relationship without deliberately damaging your partner's self-esteem. Emphasize your mutual incompatibility, and admit your own contributions to the problem.
- *If you are the rejected person, give yourself time to resolve your anger and pain.* Mobilize your coping resources, including social support and other stress management techniques. You may go through a process of mourning the relationship, experiencing disbelief, anger, sadness, and finally acceptance. Remember that there are actually many people with whom you can potentially have an intimate relationship.
- *Recognize the value in the experience.* You honor the feelings that you shared with your partner by validating the relationship as a worthwhile experience. Ending a close relationship can teach you valuable lessons about your needs,

preferences, strengths, and weaknesses. Use your insights to increase your chance of success in your next relationship.

Use the recovery period following a breakup for self-renewal. Redirect more of your attention to yourself, and reconnect with people and areas of your life that may have been neglected as a result of the relationship. Time will help heal the pain of the loss of the relationship.

Finally, be aware of the tendency or impulse to "rebound" quickly into another relationship. Although a new relationship may mute the pain of a breakup, forming a relationship in order to avoid feeling pain is not a good strategy. Too often, rebound relationships fail because they were designed to be "life boats" or because one or both of the partners is not truly ready to be close to someone else again.

COMMUNICATION

The key to developing and maintaining any type of intimate relationship is good communication. Most of the time we don't actually think about communicating; we simply talk and behave naturally. But when problems arise—when we feel others don't understand us or when someone accuses us of not listening—we become aware of our limitations or, more commonly, what we think are other people's limitations. Miscommunication creates frustration and distances us from our friends and partners.

Nonverbal Communication

Even when we're silent, we're communicating. We send messages when we look at someone or look away, lean forward or sit back, smile or frown. Especially important forms of nonverbal communication are touch, eye contact, and proximity. If someone we're talking to touches our hand or arm, looks into our eyes, and leans toward us when we talk, we get the message that the person is interested in us and cares about what we're saying. If a person keeps looking around the room while we're talking or takes a step backward, we get the impression the person is uninterested or wants to end the conversation.

The ability to interpret nonverbal messages correctly is important to the success of relationships. It's also important, when sending messages, to make sure our body language

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever ended an intimate relationship? If so, how did you handle it? How did you feel after the breakup? How did the breakup affect your former partner? Did the experience help you in other relationships?



TAKE CHARGE

Guidelines for Effective Communication

Getting Started

- When you want to have a serious discussion with your partner, choose a private place and a time when you won't be interrupted or rushed.

- Face your partner and maintain eye contact. Use nonverbal feedback to show that you are interested and involved.

Being an Effective Speaker

- State your concern or issue as clearly as you can.
- Use "I" statements rather than statements beginning with "you." When you use "I" statements, you take responsibility for your feelings. "You" statements are often blaming or accusatory and will probably get a defensive or resentful response. The statement "I feel unloved," for example, sends a clearer, less blaming message than the statement "You don't love me."
- Focus on a behavior, not the whole person. Be specific about the behavior you like or don't like. Avoid generalizations beginning with "you always" or "you never." Such statements make people feel defensive.
- Make constructive requests. Opening your request with "I would like" keeps the focus on your needs rather than your partner's supposed deficiencies.
- Avoid blaming, accusing, and belittling. Even if you are right, you have little to gain by putting your partner down. When people feel criticized or attacked, they are less able to think rationally or solve problems constructively.
- Ask for action ahead of time, not after the fact. Tell your partner what you would like to have happen in the future;

don't wait for him or her to blow it and then express anger or disappointment.

Being an Effective Listener

- Provide appropriate nonverbal feedback (nodding, smiling, making eye contact, and so on).
- Don't interrupt.
- Listen reflectively. Don't judge, evaluate, analyze, or offer solutions (unless asked to do so). Your partner may just need to sort out his or her feelings. By jumping in to "fix" the problem, you may cut off communication.
- Don't give unsolicited advice. Giving advice implies that you know more about what a person needs to do than he or she does; therefore, it often evokes anger or resentment.
- Clarify your understanding of what your partner is saying by restating it in your own words and asking if your understanding is correct. "I think you're saying that you would feel uncomfortable having dinner with my parents and that you'd prefer to meet them in a more casual setting. Is that right?" This type of specific feedback prevents misunderstandings and helps validate the speaker's feelings and message.
- Be sure you are really listening, not off somewhere in your mind rehearsing your reply. Try to tune in to your partner's feelings as well as the words. Accurately reflecting the other person's feelings is often a more powerful way of connecting than just reframing his or her thoughts.
- Let your partner know that you value what he or she is saying and want to understand. Respect for the other person is the cornerstone of effective communication.

agrees with our words. When our verbal and nonverbal messages don't correspond, we send a mixed message.

Digital Communication

Recent years have brought about an enormous surge in communication through texting, tweeting, social networking websites, Skype, e-mail, mobile phones, blogging, and instant messaging. The great variety of ways that people use digital technology to communicate makes it somewhat difficult to talk about "digital communication" as a single thing. The brief immediacy of a tweet is very different from an extended conversation over Skype. An e-mail message might be as

QUICK STATS

32.2% of college students say their intimate relationships have been traumatic or hard to handle at least once in the past year.

—American College Health Association, 2011

long as an old-fashioned handwritten letter, while a text message may be just a few characters long.

Digital communication channels enable us to communicate more rapidly, but some experts question whether this capability is affecting interpersonal relations and possibly even affecting our ability to relate to others in person. But researchers disagree on the effect that these means of communication have on human relationships as a whole. While some worry that an increase in digital communication requires a decrease in face-to-face contact, others are fascinated by the possibilities for making connections with people whom we might never have an opportunity to meet face-to-face.

Communication Skills

Three keys to good communication in relationships are self-disclosure, listening, and feedback:

- **Self-disclosure** involves revealing personal information that we ordinarily wouldn't reveal because of the risk involved. It usually increases feelings of closeness and moves the relationship to a deeper level of intimacy. Friends often disclose the most to each other, sharing feelings, experiences, hopes, and disappointments. Married couples sometimes share less because they think they already know everything about each other.

- **Listening** requires that we spend more time and energy trying to fully understand another person's "story" and less time judging, evaluating, blaming, advising, analyzing, or trying to control. Empathy, warmth, respect, and genuineness are qualities of skillful listeners. Attentive listening encourages friends or partners to share more and, in turn, to be attentive listeners. To connect with other people and develop real emotional intimacy, listening is essential.

- **Feedback**, a constructive response to another's self-disclosure, is the third key to good communication. Giving positive feedback means acknowledging that the friend's or partner's feelings are valid—no matter how upsetting or troubling—and offering self-disclosure in response. If, for example, your partner discloses unhappiness about your relationship, it is more constructive to say that you're concerned or saddened by that and want to hear more about it than to get angry, to blame, to try to inflict pain, or to withdraw. Self-disclosure and feedback can open the door to change, whereas other responses block communication and change. (For tips on improving your skills, see the box "Guidelines for Effective Communication.")

Although good communication can't salvage a bad relationship, it enables couples to see their differences and make more informed decisions.

Gender and Communication

Some of the difficulties people encounter in relationships can be traced to common gender differences in communication. Many authorities believe that, because of the way they've been raised, men and women generally approach conversation and communication differently. According to this view, men tend to use conversation in a *competitive* way, perhaps hoping to establish dominance in relationships. When male conversations are over, men often find themselves in a one-up or a one-down position. Women tend to use conversation in a more *affiliative* way, perhaps hoping to establish friendships. They negotiate various degrees of closeness, seeking to give and receive support. Men tend to talk more—though without disclosing more—and listen less. Women tend to use good listening skills such as eye contact, frequent nodding, focused attention, and asking relevant questions.



Conflict is an inevitable part of any intimate relationship. Couples need to develop constructive ways of resolving conflicts in order to maintain a healthy relationship.

Although these are generalized patterns, they can translate into problems in specific conversations. Even when a man and a woman are talking about the same subject, their unconscious goals may be very different. The woman may be looking for understanding and closeness, while the man may be trying to demonstrate his competence by giving advice and solving problems. Both styles are valid; the problem comes when differences in style result in poor communication and misunderstanding.

Sometimes communication is not the problem in a relationship—the partners understand each other all too well. The problem is that they're unable or unwilling to change or compromise. Although good communication can't salvage a bad relationship, it does enable couples to see their differences and make more informed decisions.

Conflict and Conflict Resolution

Conflict is natural in intimate relationships. No matter how close two people become, they still remain separate individuals with their own needs, desires, past experiences, and ways of seeing the world. In fact, the closer the relationship, the more differences and the more opportunities for conflict there will be.

Conflict itself isn't dangerous to a relationship. In fact, it may indicate that the relationship is growing. But if it isn't handled constructively, conflict can damage—and ultimately destroy—the relationship. Consider the following guidelines, but remember that different couples communicate in different ways around conflict.

Conflict is often accompanied by anger—a natural emotion, but one that can be difficult to handle. If we express anger aggressively, we risk creating distrust, fear,

and distance. If we act it out without thinking things through, we can cause the conflict to escalate. If we suppress anger, it turns into resentment and hostility. The best way to handle anger in a relationship is to recognize it as a symptom of something that requires attention and needs to be changed. When angry, partners should exercise restraint so as not to become abusive. It is important to express anger skillfully and not in a way that is out of proportion to the issue at hand.

The sources of conflict for couples change over time but primarily revolve around the basic tasks of living together: dividing the housework, handling money, spending time together, and so on. Sexual interaction is also a source of disagreement for many couples.

Although there are numerous theories on and approaches to conflict resolution, the following strategies can be helpful when negotiating with a partner:

1. *Clarify the issue.* Take responsibility for thinking through your feelings and discovering what's really bothering you. Agree that one partner will speak first and have the chance to speak fully while the other listens. Then reverse the roles. Try to understand your partner's position fully by repeating what you've heard and asking questions to clarify or elicit more information. Agree to talk only about the topic at hand and not get distracted by other issues. Sum up what your partner has said.
2. *Find out what each person wants.* Ask your partner to express his or her desires. Don't assume you know what your partner wants, and don't speak for him or her.
3. *Determine how you both can get what you want.* Brainstorm to come up with a variety of options.
4. *Decide how to negotiate.* Work out a plan for change. For example, one partner will do one task and the other will do another task. Be willing to compromise, and avoid trying to "win."
5. *Solidify the agreements.* Go over the plan and write it down, if necessary, to ensure that you both understand and agree to it.
6. *Review and renegotiate.* Decide on a time frame for trying out your plan, and set a time to discuss how it's working. Make adjustments as needed.

To resolve conflicts, partners have to feel safe in voicing disagreements. They have to trust that the discussion won't get out of control, that they won't be abandoned by the other, and that the partner won't take advantage of their vulnerability. Partners should follow some basic ground rules when they argue, such as avoiding ultimatums, resisting the urge to give the silent treatment, refusing to "hit below the belt," and not using sex to smooth over disagreements.

When you argue, maintain a spirit of goodwill and avoid being harshly critical or contemptuous. Remember—you care about your partner and want things to work out. See the disagreement as a difficulty that the two of you have together rather than as something your partner does to you. Finish serious discussions on a positive note by expressing your respect and affection for your partner and your appreciation for having been listened to. If you and your partner find that you argue again and again over the same issue, it may be better to stop trying to resolve that problem and instead come to accept the differences between you.

PAIRING AND SINGLEHOOD

Although most people eventually marry or commit to a partner, everyone spends some time as a single person, and nearly all people make some attempt, consciously or unconsciously, to find a partner. Intimate relationships are as important for singles as for couples.

Choosing a Partner

Most men and women select partners for long-term relationships through a fairly predictable process, although they may not be consciously aware of it. First attraction is based on easily observable characteristics: looks, dress, social status, and reciprocated interest. Most people pair with someone who

- Lives in the same geographic area.
- Is from a similar ethnic and socioeconomic background.
- Has similar educational attainment.
- Lives a similar lifestyle.
- Is like them in terms of physical attractiveness.

Once the euphoria of romantic love winds down, personality traits and behaviors become more significant factors in how the partners view each other. The emphasis shifts to basic values and future aspirations regarding career, family, and children. At some point, they decide whether the relationship feels viable and is worthy of their continued commitment.

Perhaps the most important question for potential mates to ask is, "How much do we have in common?" Although differences add interest to a relationship, similarities increase the chances of a relationship's success. Differences can affect a relationship in the

areas of values, religion, ethnicity, attitudes toward sexuality and gender roles, socioeconomic status, familiarity with each other's culture, and interactions with the extended family. But acceptance and communication skills go a long way toward making a relationship work, no matter how different the partners.

The most important question for potential mates to ask is, "How much do we have in common?"



Regardless of an individual's intentions, physical attraction usually plays a strong role in the initial choosing of a partner. People tend to gravitate toward others who share similar characteristics, such as appearance, ethnicity, education, and socioeconomic background.

Dating

Every culture has certain rituals for pairing and finding mates. Parent-arranged marriages, still the norm in many cultures, are often very stable and permanent. Although the American cultural norm is personal choice in courtship and mate selection, the popularity of dating services and online matchmaking suggests that many people want help finding a suitable partner.

Many people find romantic partners through some form of dating. They narrow the field through a process of getting to know each other. Dating often revolves around a mutually enjoyable activity, such as seeing a movie or having dinner. Casual dating may then evolve into steady or exclusive dating, then engagement, and finally marriage.

In recent years, traditional dating has given way to a more casual form of getting together in groups. Two people may begin to spend more time together, but often in the group context. If sexual involvement develops, it is more likely to be based on friendship, respect, and common interests than on expectations related to gender roles. In this model, mate selection may progress from getting together to living together to marriage.

Among some teenagers and young adults, dating has been all but supplanted by hooking up—casual sexual activity without any relationship commitment. For more about this trend, see the box “Hooking Up.”

Online Relationships

Online dating sites like Match.com and eHarmony have become incredibly popular in recent years, especially among young adults seeking an intimate partner or new friends. Connecting with people online has advantages and drawbacks. It allows people to communicate in a relaxed way, to



For many college students today, group activities have replaced dating as a way to meet and get to know potential partners.

try out different personas, and to share things they might not share when face-to-face with family or friends. It's easier to put yourself out there without too much investment; you can get to know someone from the comfort of your own home, set your own pace, and start and end relationships at any time. With millions of singles using dating sites that let them describe exactly what they are seeking, the Internet can increase a person's chance of finding a good match.

There are drawbacks, however, to meeting people online. Too often participants misrepresent themselves, pretending to be very different—older or younger or even of a different sex—than they really are. Investing time and emotional resources in such relationships can be painful. In rare cases, online romances become dangerous or even deadly (see Chapter 21 for information on cyberstalking).

Because people have greater freedom to reveal only what they want to, users should also be aware of a greater tendency to idealize online partners—setting themselves up for later disappointment. If your online friend seems perfect, take that as a warning sign. Conversely, looking for partners online can be like shopping—all the choices

QUICK STATS

40 million adult Americans have tried using an online dating service.

—Statistic Brain, 2012



WELLNESS ON CAMPUS

Hooking Up

A current trend among teenagers, young adults, and college students is *hooking up*—having casual sexual encounters with acquaintances or strangers with no commitment or investment in a relationship. The sexual activity can be anything from kissing to intercourse, but the key element is the lack of emotional intimacy. Although casual sex is not new, the difference today is that hooking up seems to be the main form of sexual activity for many people, as opposed to sexual activity within a relationship. Some data indicate that more than 80% of college students have had at least one hookup experience. If dating occurs at all, it happens after people have had sex and become a couple.

Hooking up most likely has its roots in the changing social and sexual patterns of the 1960s. Since then, changes in college policies have contributed to the shift, such as the move away from colleges acting *in loco parentis* (in the place of parents), the trend toward coed dorms, and the increase in the percentage of women in student populations and the decreased availability of men. This behavior addresses the desire for “instant intimacy,” but also protects the participants from the risk or responsibility of emotional involvement.

Because hooking up is often fueled by alcohol, it is associated with sexual risk taking and negative health effects, including the risk of acquiring a sexually transmitted disease. In 2007, for example, young adults aged 15 to 24 had rates of chlamydia that

were 4 to 5.5 times the overall incidence rate for the general population, according to the CDC. Hooking up can also have emotional and mental health consequences, including sexual regret, negative emotional reactions, psychological distress, depression, and anxiety. Women are more likely to suffer these reactions after hooking up, but men experience them too. Biological anthropologists suggest that having sex—even casual sex—sets off hormones that cause feelings of bonding and attachment, which are inevitably thwarted in a hookup.

On some campuses, a backlash against hooking up has taken place. In some cases, individuals are deciding they don’t want to be part of the hookup culture. In other cases, groups and organizations have formed to call for a return to traditional dating or at least some middle ground between dating and hooking up that doesn’t have the potential to cause physical and emotional harm. The existence of alternative social and sexual norms can help students think twice about their sexual activities.

SOURCES: Downing-Matibag, T. M., and Gelsenger, B. 2009. Hooking up and sexual risk taking among college students: a health belief model perspective. *Qualitative Health Research* 19(9): 1196–1209; Bachtel, M. Is dating really dead? Emerging evidence on the college hookup culture and health issues. *Action Newsletter, American College Health Association* 49(2): 16–18; Chen, S. 2010. No hooking up, no sex for some coeds (<http://www.cnn.com/2010/LIVING/04/19/college.antl.hookup.culture/index.html?hpt=Sbin>).

may increase your tendency to search for perfection or find fault quickly, and prevent you from giving people a chance. Keep your expectations realistic.

Relationship sites also remove an important and powerful source of information from the process: chemistry and in-person intuition. Much of our communication is transmitted through body language and tone, which aren’t obvious in text messages and can’t be fully captured even by web cams and microphones. Trust your feelings about the process of the relationship. Are you revealing more than the other person? Is there a balance in the amount of time spent talking by each of you? Is the other person respecting your boundaries? Just as in real-life dating, online relationships require you to use common sense and to trust your instincts.

If you pursue an online relationship, the following strategies can help you have a positive experience and stay safe:

- To improve your chances of meeting people interested in you as a person, avoid sexually oriented websites. Some sites that seem like dating sites are actually used for “hooking up”—that is, arranging meetings for casual sex—rather than for building relationships. Inspect each site thoroughly before registering or providing any information about yourself. If you aren’t comfortable with a site’s content or purpose, close your

web browser and clear out its cache and its store of cookies. (If you don’t know how to do this, check your browser’s help system for instructions.)

- Know what you are looking for as well as what you can offer someone else. If you are looking for a relationship, make that fact clear. Find out the other person’s intentions.



Online dating services are now a multibillion dollar industry in the United States, offering millions of Americans a chance to meet a potential mate.

- Dating sites let users upload photos, but your photo can be downloaded by anyone, distributed to other individuals or sites, and even altered. Don't post photos unless you are completely comfortable with the potential consequences.

- Don't give out personal information, including your real full name, school, or place of employment, until you feel sure that you are giving the information to someone who is trustworthy. Do not give out your contact information over the Internet.

- Set up a second e-mail account for sending and receiving dating-related e-mails. Don't use your primary e-mail account for dealing with relationship websites.

- If someone does not respond to a message, don't take it personally. There are many reasons why a person may not pursue the connection. Don't send messages to an unresponsive person; doing so could lead to an accusation of stalking. If someone stops responding, drop the interaction completely.

- Before deciding whether to meet an online friend in person, arrange to talk over the phone a few times.

- Don't agree to meet someone face-to-face unless you feel completely comfortable about it. Always meet initially in a very public place—a museum, a coffee shop, or a restaurant—not in private, and especially not at your home. Bring along a friend to increase your safety, and let others know where you will be.

If you pursue online relationships, don't let them interfere with your other personal relationships and social activities. Online dating can become addictive. To protect your emotional and personal wellness, use the Internet to widen your circle of friends, not shrink it.

Living Together

According to the U.S. Census Bureau, about 5.4 million opposite-sex couples and 700,000 same-sex couples live together in the United States. The Human Rights Campaign, however, estimates that the number of same-sex couples in the United States is closer to 1.6 million. Living together, or **cohabitation**, is one of the most rapid and dramatic social changes that has ever occurred in our society. It seems to be gaining acceptance as part of the normal mate selection process. By age 30, about half of all men and women will have cohabited. Several factors are involved in this change, including greater acceptance of premarital sex, increased availability of contraceptives, the tendency for people to wait longer before getting married, and a larger pool of single and divorced individuals.

Cohabitation is more popular among younger people than older, although a significant number of older couples live to-

gether without marrying to avoid losing a source of income, such as Social Security benefits, should they marry. Cohabitation provides many of the benefits of marriage: companionship; a setting for an enjoyable and meaningful relationship; a chance to develop greater intimacy through learning, compromising, and sharing; a satisfying sex life; and a way to save on living costs.

Living together has certain advantages over marriage. For one thing, it can give the partners a greater sense of autonomy. Not bound by the social rules and expectations that are part of the institution of marriage, partners may find it easier to keep their identities and more of their independence. Cohabitation doesn't incur the same obligations as marriage. If things don't work out, the partners may find it easier to leave a relationship that hasn't been legally sanctioned.

But living together has some drawbacks, too. In most cases, the legal protections of marriage are absent, such as health insurance benefits and property and inheritance rights. These considerations can be particularly serious if the couple has children. Couples may feel social or family pressure to marry or otherwise change their living arrangements, especially if they have young children. The general trend, however, is toward legitimizing nonmarital partnerships; for example, some employers, communities, and states now extend benefits to unmarried domestic partners.

Although many people choose cohabitation as a kind of trial marriage, unmarried partnerships tend to be less stable than marriages. A 2010 survey conducted by the National Center for Health Statistics revealed that cohabitation is much less likely than marriage to survive the one-, three-, and five-year milestones.

There is little evidence that cohabitation before marriage leads to happier or longer-lasting marriages. In fact, some studies have found slightly less marital satisfaction and slightly higher divorce rates among couples who cohabited before marrying.

Same-Sex Partnerships

Regardless of **sexual orientation**, most people look for love in a committed relationship. A person whose sexual orientation is lesbian, gay, or bisexual (LGB) may be involved in a

QUICK STATS

Cohabiting couples have a 51% chance of marrying after three years together.

—CDC, 2010

TERMS

cohabitation Living together in a sexual relationship without being married.

sexual orientation A consistent pattern of emotional and sexual attraction based on biological sex; it exists along a continuum that ranges from exclusive heterosexuality (attraction to people of the other sex) through bisexuality (attraction to people of both sexes) to exclusive homosexuality (attraction to people of one's own sex).



Greater openness has made gay men and lesbians more visible than they used to be, although they still constitute a minority of the population.

same-sex (**homosexual**) relationship. Same-sex couples have many similarities with **heterosexual** couples (those who seek members of the opposite sex). According to one study, most gay men and lesbians have experienced at least one long-term relationship with a single partner. Like any intimate relationship, same-sex partnerships provide intimacy, passion, and security.

Same-sex partnerships tend to be more egalitarian (equal) and less organized around traditional gender roles. Same-sex couples put greater emphasis on partnership than on role assignment. Domestic tasks are shared or split, and both partners usually support themselves financially.

Another difference between heterosexual and homosexual relationships is that same-sex partners often have to deal with societal hostility or ambivalence toward their relationship, in contrast to the societal approval and rights given to heterosexual couples (see the box “Same-Sex Marriage and Civil Unions”). *Homophobia*, which is fear or hatred of homo-

homosexual Emotional and sexual attraction to people of one’s own sex.

heterosexual Emotional and sexual attraction to people of the other sex.

TERMS

sexuals, can be obvious, as in the case of violence or discrimination, or subtle, such as how same-sex couples are portrayed in the media. Additional stress can arise if an LGB individual belongs to a family or ethnic group that doesn’t accept her or his sexual orientation.

Bisexual people involved in heterosexual relationships may feel shame or guilt about the acceptance and privileges afforded to them by their heterosexual relationship. Because of societal disapproval, community resources and support may be more important for same-sex couples than for heterosexuals as a source of identity and social support. Many communities offer support groups for same-sex partners and families to help them build social networks and a sense of pride and acceptance.

Although many challenges for same-sex partnerships are common to all relationships, some issues are unique to LGB partnerships. Because men are not socialized to communicate about interpersonal and emotional issues, communication problems may be particularly common or acute in gay relationships. Some researchers suggest that the process of female socialization, with its emphasis on creating and maintaining intimacy, makes lesbian relationships more likely to be characterized by emotional fusion, enmeshment, and a blurring of boundaries.

Problems may also arise when one member of a same-sex relationship has come out, or publicly identified as LGB, earlier than the other. Consequently, the more experienced individual may wonder and worry whether the partner’s sexual orientation is transient. The less experienced member of the relationship may feel threatened by the partner’s level of “outness” or involvement in the LGB community. If same-sex couples decide to seek counseling, it is important to find a therapist who is an ally to the LGB community and who has training and experience working with LGB couples.

People with diverse sexual orientations and gender identities are often grouped together in the category “LGBT,” “LGBTQ,” or “LGBTQI,” where T is for transgender, Q is for questioning or queer, and I is for intersex. Transgender individuals—people whose biological sex doesn’t match their gender identity—and intersex individuals—people born with ambiguous genitals—may be heterosexual, homosexual, or bisexual, or they may feel that current definitions of sexual orientation and gender are too narrow to apply to them. See Chapter 5 for more information about sexual orientation, gender identity, and sexual behavior.

Singlehood

Despite the popularity of marriage, a significant and growing number of adults in our society have never been married—more than 116 million single individuals. The largest group of unmarried adults have never been married (Figure 4.1).

Several factors contribute to the growing number of single people. One is the changing view of singlehood, which is

DIVERSITY MATTERS

Same-Sex Marriage and Civil Unions



Marriage is an institution defined by state and federal statutes that confer legal and economic rights and responsibilities to every married couple. The U.S. General Accountability Office says more than 1000 federal laws make distinctions based on marriage. Marital status affects many aspects of life, such as Social Security benefits, federal tax status, inheritance, and medical decision making.

The push for legal recognition of same-sex partnerships has gone on for decades. Supporters of same-sex marriage rights, however, have met opposition at the local, state, and federal levels, in both the public and private sectors.

The majority of states and the federal government have passed laws and amendments that effectively ban same-sex marriage. The federal Defense of Marriage Act (DOMA), enacted in 1996, defines marriage as the legal union between one man and one woman and refuses federal recognition of same-sex marriages. It also allows states to refuse to recognize same-sex marriages and civil unions performed in other states or countries. (Such action might otherwise be in violation of the Constitution's provision that each state give "full faith and credit" to the laws of other states.)

In 2009 the Respect for Marriage Act was introduced in the U.S. House of Representatives. If enacted, the legislation would overturn the Defense of Marriage Act and entitle legally married same-sex couples to the benefits of marriage under federal law. However, the bill did not make it through Congress. In 2011 the bill was reintroduced to Congress but met the same fate. The act would also ensure same-sex couples that their federal rights would follow them if they moved to another state that does not approve same-sex marriages. The act would not force states to recognize or license same-sex marriages or to change any existing state laws on the issue.

Another proposed piece of federal legislation, called the Domestic Partnership Benefits and Obligations act, would extend the same benefits to domestic partners of federal civilian employees as those offered to employees' spouses. These benefits would include participa-



tion in retirement programs, compensation for work-related injuries, and life and health insurance benefits. Such benefits would be available to both same- and opposite-sex domestic partners of federal employees. As with the Respect for Marriage Act, this piece of legislation was reintroduced in the 111th Congress and is still pending.

As of early 2012, the status of same-sex marriage and civil union laws was as follows in the United States:

- Most states had enacted their own DOMAs and/or passed state constitutional amendments that ban same-sex marriages and/or civil unions. Most of these states further refuse to recognize same-sex marriages from other states.
- New York, Connecticut, Iowa, Massachusetts, New Hampshire, Vermont, and the District of Columbia issued marriage licenses to same-sex couples.
- Bills legalizing same-sex marriages had been passed or put forward in Washington, New Jersey, Maryland, and California. Each of those bills, however, was the subject of a court battle or a public referendum and so had not gone into effect.
- Several states now provide some or all state-level spousal rights to same-sex couples. The type of union and scope of rights vary from state to state.
- A growing number of municipalities and private corporations now extend

health insurance coverage and other benefits to the same-sex spouses and domestic partners of their gay and lesbian employees.

Opponents of civil unions and same-sex marriage offer several arguments against such unions. For example, opponents claim that the purpose of marriage is to procreate, that the Bible forbids same-sex unions, that homosexuals are seeking special rights, that same-sex unions are bad for children and families, and that most Americans oppose such unions. (Many recent polls show that most Americans oppose legalizing same-sex marriage, but a growing number support civil unions.) The primary argument, however, is that same-sex marriage undermines the sanctity and validity of marriage as it is traditionally understood and thus undermines society. Rules and restrictions on who can marry preserve the value of the institution of marriage, according to this view. The underlying assumption of this position is that homosexual behavior is a choice and that people can change their orientation, though the process may be difficult.

Proponents of civil unions and same-sex marriage believe that sexual orientation is outside the control of the individual and results from genetic and environmental factors that create an unchangeable orientation. The issue of same-sex union is then seen as one of basic civil rights, in which a group is being denied rights—to publicly express their commitment to one another, to provide security for their children, and to receive the legal and economic benefits afforded to married heterosexual couples—on the basis of something as unalterable as skin color.

Opponents and proponents of same-sex marriage agree that marriage is healthy for both men and women and is the main social institution promoting family values; both sides see this assertion as supportive of their position. What remains to be seen is how society in general is going to view same-sex marriage in the future—as a furthering of American values or as an attack on them.

connect
ACTIVITY
DO IT ONLINE

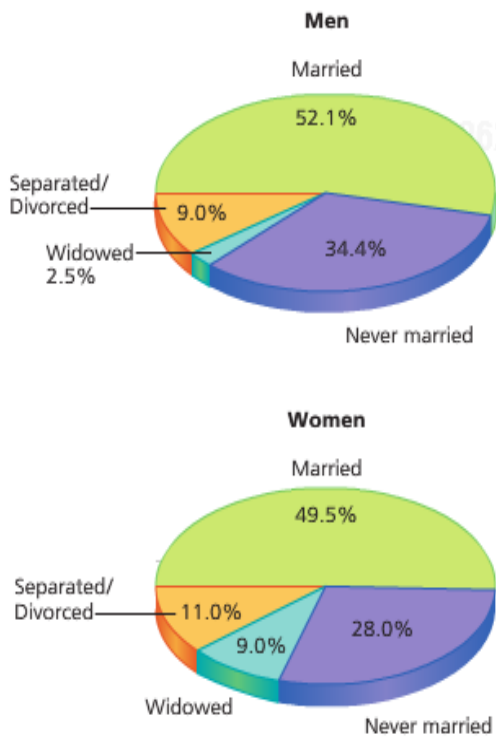


FIGURE 4.1 Marital status of the U.S. population aged 15 years and older, 2011.

SOURCE: U.S. Census Bureau. 2012. *America's Families and Living Arrangements, 2011* (<http://www.census.gov/population/www/socdemo/hh-fam/cps2011.html>).

increasingly being viewed as a legitimate alternative to marriage. Education and careers are delaying the age at which young people are marrying. The median age for marriage is now 28.2 years for men and 26.1 years for women. More young people are living with their parents as they complete their education, seek jobs, or strive for financial independence. Many other single people live together without being married. Gay people who would marry their partners if they were legally permitted to do so are counted among the single population. High divorce rates mean more singles, and people who have experienced divorce may have more negative attitudes about marriage and more positive attitudes about singlehood.

Being single, however, does not mean living without the benefit of close relationships. Single people date, enjoy active and fulfilling social lives, and have a variety of sexual experiences and relationships. Other advantages of being single include more opportunities for personal and career development without concern for family obligations and more freedom and control in making life choices. Disadvantages include loneliness and a lack of companionship, as well as economic hardships (mainly for single women). Single men and women alike experience some discrimination and often are pressured to get married.

QUICK STATS

Just over 2 million marriages took place in the United States in 2009.

—National Center for Health Statistics, 2010

Nearly everyone has at least one episode of being single in adult life, whether prior to marriage, between marriages, following divorce or the death of a spouse, or for his or her entire life. How enjoyable and valuable this single time is depends on several factors, including how deliberately the person has chosen it; how satisfied the person is with his or her social relationships, standard of living, and job; how comfortable the person feels when alone; and how resourceful and energetic the person is about creating an interesting and fulfilling life.

MARRIAGE

The majority of Americans marry at some time in their lives. Marriage continues to remain popular because it satisfies several basic needs. There are many important social, moral, economic, and political aspects of marriage, all of which have changed over the years. In the past people married mainly for practical reasons, such as raising children or forming an economic unit. Today people marry more for personal, emotional reasons.

The Benefits of Marriage

The primary functions and benefits of marriage are those of any intimate relationship: affection, personal affirmation, companionship, sexual fulfillment, and emotional growth.

Marriage also provides a setting in which to raise children, although an increasing number of couples choose to remain childless, and people can also choose to raise children without being married. Marriage is also important for providing for the future. By committing themselves to the relationship, people establish themselves with lifelong companions as well as some insurance for their later years.

Research shows that good marriages have myriad positive effects on individuals' health. (See the box "Are Intimate Relationships Good for Your Health?")

Issues in Marriage

Although we might like to believe otherwise, love is not enough to make a successful marriage. Couples have to be strong and successful in their relationship before getting married because relationship problems will be magnified rather than solved by marriage. The following relationship characteristics appear to be the best predictors of a happy marriage:

- The partners have realistic expectations about their relationship.
- Each feels good about the personality of the other.

EMBRACING WELLNESS

Are Intimate Relationships Good for Your Health?



Findings suggest that there are intrinsic benefits to marriage. Married people, on average, live longer than unmarried people—whether single, divorced, or widowed—and they score higher on measures of mental health. They have a lower prevalence of headaches, low-back pain, inactivity, and psychological distress. Married people consistently report being happier than unmarried people.

The benefits of intimate relationships have been demonstrated for a range of conditions: People with strong social support are less likely to catch colds. They recover better from heart attacks, live longer with heart disease, and have higher survival rates for certain cancers. Married men with prostate cancer live significantly longer than those who are single, divorced, or widowed. Women in satisfying marriages are less likely to develop risk factors for cardiovascular diseases than unmarried or unhappily married women. People who never marry have a higher chance of dying prematurely than people who have been divorced, separated, or widowed.

What is it about marriage that supports wellness? Some studies suggest that partners may encourage and reinforce healthy habits, such as exercising, eating right, and seeing a physician when needed. In times of illness, a loving partner can give practical help and emotional support. Feeling loved, esteemed, and valued brings comfort in times of vulnerability, reduces anxiety, and miti-



gates the damaging effects of stress and social isolation.

Although good relationships may help people stay well, bad relationships may have the opposite effect. The impact of relationship quality on health may be partly explained by its effects on the immune system: A study of married couples whose fighting escalated to criticism and name-calling found them to have weaker immune responses than couples whose arguments were more civil. Hostile couples need more time for injuries to heal; their systems tend to contain higher levels of inflammatory agents (such as cortisol), which have been linked to long-term illness. High marital stress is linked with risky lifestyle choices and nonadherence to medical regimens. Unhappy marriages are associated with risk factors for heart disease, such as depression, hostility, and anger.

Marriage, of course, isn't the only support system available. If you have supportive people in your life, you are likely to enjoy better physical and emotional health than if you feel isolated and alone. So when you start planning lifestyle changes to improve your health and well-being, don't forget to nurture your relationships with family and friends. Strong relationships are powerful medicine.

connect
ACTIVITY
DO IT ONLINE

- They communicate well.
- They have effective ways of resolving conflicts.
- They agree on religious/ethical values.
- They have an egalitarian role relationship.
- They have a good balance of individual versus joint interests and leisure activities.

Once married, couples must provide each other with emotional support, negotiate and establish marital roles, establish domestic and career priorities, handle their finances, make sexual adjustments, manage boundaries and relationships with their extended family, and participate in the larger community.

Marital roles and responsibilities have undergone profound changes over time. Many couples no longer accept traditional role assumptions, such as that the husband is solely responsible for supporting the family and the wife is solely responsible for domestic work. Many husbands share domestic tasks, and many wives work outside the home. In

fact, over 50% of married women are in the labor force, including women with babies under one year of age. Although women still take most of the responsibility for home and children even when they work and although men still suffer more job-related stress and health problems than women do, the trend is toward an equalization of responsibilities in the home.

The Role of Commitment

Coping with all these challenges requires that couples be committed to remaining in their relationships through the inevitable ups and downs. They need to be tolerant of each other's imperfections and keep their perspective and sense of humor. Commitment is based on conscious choice rather than on feelings, which, by their very nature, are transitory. Commitment is a promise of a shared future—a promise to be together, come what may. Committed partners put effort and energy into the relationship, no matter how they feel. They

take time to attend to their partners, give compliments, and deal with conflict when necessary. Commitment has become an important concept in recent years. To many people, commitment is a more important goal than living together or marriage.

To many people, commitment is a more important goal than living together or marriage.

Separation and Divorce

Divorce is fairly common in the United States (Figure 4.2). Those who have never experienced divorce personally—either their own or that of their parents—almost certainly have friends or relatives who have. The high rate of divorce in the United States may reflect our extremely high expectations for emotional fulfillment and satisfaction in marriage. It may also indicate that our culture no longer embraces the permanence of marriage.

The process of divorce usually begins with an emotional separation. Often one partner is unhappy and looks beyond the relationship for other forms of validation. Dissatisfac-

tion increases until the unhappy partner decides he or she can no longer stay. Physical separation follows, although it may take some time for the relationship to be over emotionally.

Except for the death of a spouse or family member, divorce is the greatest stress-producing event in life. Research shows that divorced women are more likely to develop heart disease than married, remarried, or widowed

women. Both men and women experience turmoil, depression, and lowered self-esteem during and after divorce. People experience separation distress and loneliness for about a year and then begin a recovery period of one to three years. During this time they gradually construct a postdivorce identity, along with a new pattern of life. Most people are surprised by how long it takes to recover from divorce.

Children are especially vulnerable to the trauma of divorce, and sometimes counseling is appropriate to help them adjust to the changes in their lives. However, recent research has found that children who spend substantial time with both parents are usually better adjusted than those in sole custody arrangements and are as well-adjusted as their peers from intact families.

In certain cases, grown children leaving home coincide with a couple's decision to separate. Coping with divorce can be difficult for children at any age, even those who consider themselves to be adults.

Despite the distress of separation and divorce, the negative effects are usually balanced sooner or later by the possibility of finding a more suitable partner, constructing a new life, and developing new aspects of the self. About 75% of all people who divorce remarry, often within five years. One result of the high divorce and remarriage rate is a growing number of stepfamilies.

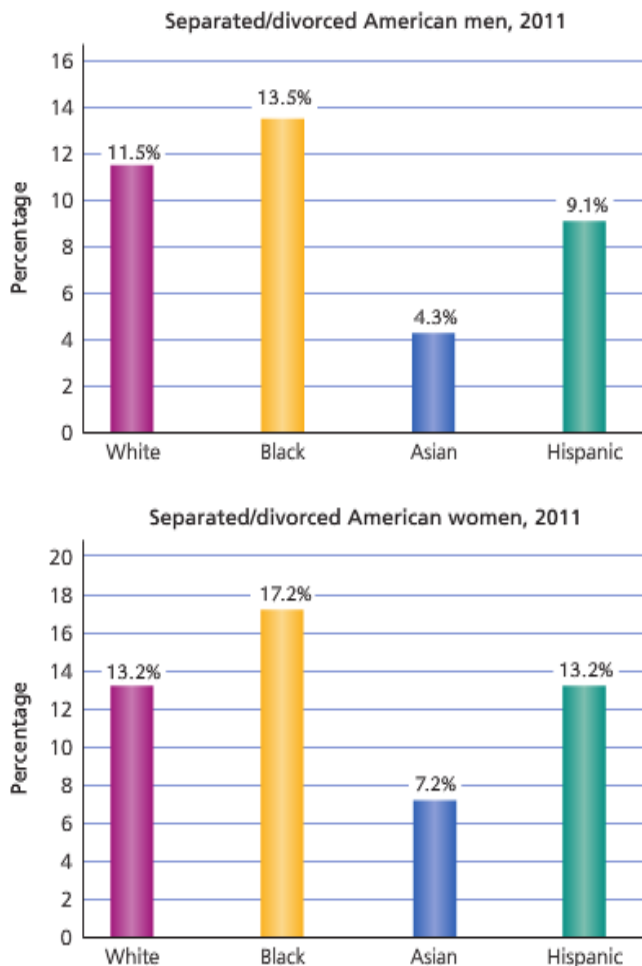


FIGURE 4.2 Percentage of separated and divorced Americans, 2011.

SOURCE: U.S. Census Bureau. 2012. *America's Families and Living Arrangements, 2011* (<http://www.census.gov/population/www/socdemo/hh-fam/cps2011.html>).

FAMILY LIFE

American families are very different today than they were even a few decades ago. Currently 69% of children under the age of 18 live with both parents (either married or unmarried), while 27% of children live with a single parent. The remaining 4% of children live in a household where neither parent is present.

Becoming a Parent

Few new parents have any preparation for the job of parenting, yet they literally must assume the role overnight. They must quickly learn how to hold and feed a baby, change diapers, and differentiate a cry of hunger from a cry of pain or fear. No wonder the birth of the first child is one of the most stressful transitions for any couple.

Even couples with an egalitarian relationship before their first child is born find that their marital roles become more traditional with the arrival of the new baby. The father

typically becomes the primary provider and protector, and the mother typically becomes the primary nurturer. Most research indicates that mothers have to make greater changes in their lives than fathers do. Although men today spend more time caring for their infants than ever before, women still take the ultimate responsibility for the baby. Women are usually the ones who make job changes, either quitting work or reducing work hours in order to stay home with the baby for several months or more. Many mothers juggle the multiple roles of mother, homemaker, and employer/employee and feel guilty that they never have enough time to do justice to any of these roles.

Not surprisingly, marital satisfaction often declines after the birth of the first child. The wife who has stopped working may feel she is cut off from the world; the wife who is trying to fulfill duties both at home and on the job may feel overburdened and resentful. The husband may have a hard time adjusting to having to share his wife's love and attention with the baby, as well as the stress of trying to provide for a growing family.

But marital dissatisfaction after the baby is born is not inevitable. Couples who successfully weather the stresses of a new baby seem to have these three characteristics in common:

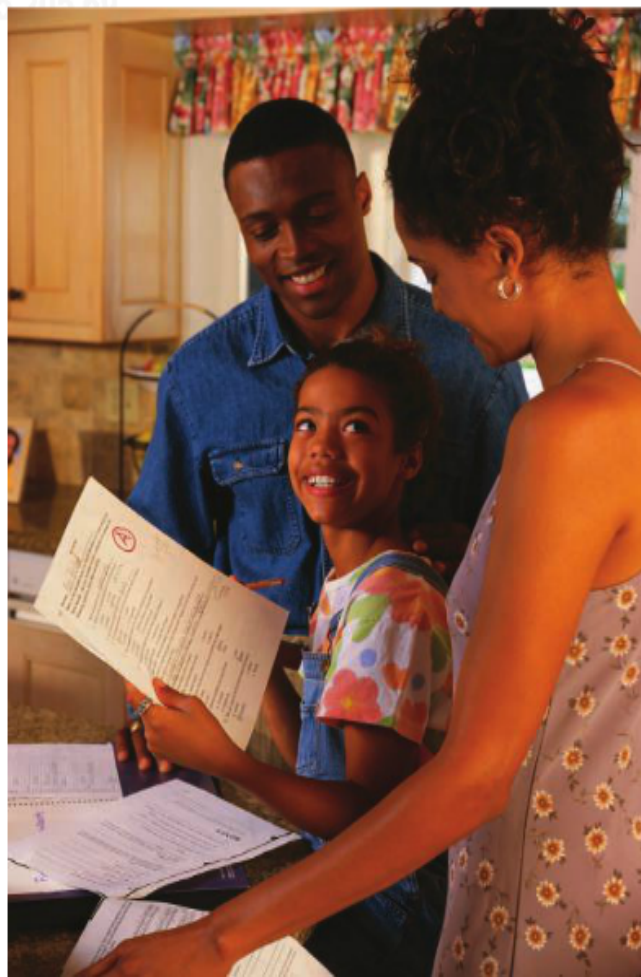
1. They had developed a strong relationship before the baby was born.
2. They had planned to have the child and want it very much.
3. They communicate well about their feelings and expectations.

Parenting

Sometimes being a parent is a source of unparalleled pleasure and pride—the first smile at you, the first word, the first home run. But at other times parenting can seem like an overwhelming responsibility.

Most parents worry about their ability to raise a healthy, responsible, and well-adjusted child. Parents may wonder about the long-term impact of each decision they make on their child's well-being and personality. According to parenting experts, no one action or decision (within limits) will determine a child's personality or development. Instead the *parenting style*, or overall approach to parenting, is most important. Parenting styles vary according to the levels of two characteristics of the parents:

- *Demandingness* encompasses the use of discipline and supervision, the expectation that children act responsibly and maturely, and the direct reaction to disobedience.
- *Responsiveness* refers to a parent's warmth and intent to facilitate independence and self-confidence in a child by being supportive, connected, and understanding of the child's needs.



Setting clear boundaries, holding children to high expectations, and responding with warmth to children's needs are all positive parenting strategies.

Several parenting styles have been identified. Each style emerges according to the parents' balance of demandingness and responsiveness. Here are some examples:

- *Authoritarian* parents are high in demandingness and low in responsiveness. They give orders and expect obedience, giving very little warmth or consideration to their children's special needs.
- *Authoritative* parents are high in both demandingness and responsiveness. They set clear boundaries and

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How do you define "commitment" in a relationship? Is it simply a matter of staying faithful to a partner, or is there more? In your own relationships, what signs of commitment do you look for from your partner? What signs of commitment does your partner see in you?

expectations, but they are also loving, supportive, and attuned to their children's needs.

- *Permissive* parents are high in responsiveness and low in demandingness. They do not expect their children to act maturely but instead allow them to follow their own impulses. They are very warm, patient, and accepting, and they are focused on not stifling their child's innate creativity.
- *Uninvolved* parents are low in both demandingness and responsiveness. They require little from their children and respond with little attention, frequency, or effort. In extreme cases, this style of parenting might reach the level of child neglect.

Children's Temperaments Every child has a tendency toward certain moods and a style of reacting—a *temperament*—that is apparent from infancy and often lasts into adulthood. Research has identified three basic temperament types. Most children show aspects of different temperaments but tend toward one.

- *Easy children* are happy and content, and have regular sleeping and eating habits. They are adaptable and not easily upset.
- *Difficult children* are fussy, are fearful in new situations or with strangers, and have irregular sleeping and feeding habits. They are easily upset and often hard to soothe.
- *Slow-to-warm-up children* are somewhat fussy and tend to react negatively or fearfully to new people or situations; however, they slowly warm up and adapt positively.

A match between parental style and child temperament is ideal. Difficulties arise when there is a mismatch in temperaments/styles and the parent is not versed in parenting skills. For example, a parent who expects quick action in response to a command may not be a good match for a child who is naturally slow to respond. Parents should be attuned to their child's distinct style and do their best to support the child.

According to psychologists, "optimal attunement" of the parent to the child involves allowing the child to feel close and connected without feeling engulfed or impinged upon, and also allowing for separation and aloneness without the child feeling abandoned or rejected. *Attachment parenting* advocates believe that if children are consistently held, attended to, and not allowed to be unhappy for any length of time, they will internalize the parents' consistent care and support and grow up more able to provide it for themselves and others.

Parenting and the Family Life Cycle Parenting that is both responsive and demanding is the most beneficial for children. Providing a balance of firm limits and clear structure along with plenty of warmth, nurturing, and respect for the child's own special needs and temperament as well as her or his growing independence is the best predictor for raising a healthy child. The important thing is to keep seeking ways to promote satisfaction for all family members—including the parents! It is also important for parents to develop and

maintain confidence in their parenting skills, their common sense—and, above all, their love for their children.

At each stage of the family life cycle, the relationship between parents and children changes. And with those changes come new challenges. The parents' primary responsibility to a small, helpless baby is to ensure its physical well-being around the clock. As babies grow into toddlers and begin to walk and talk, they begin to be able to take care of some of their own physical needs. For parents, the challenge at this stage is to strike a balance between giving children the freedom to explore and setting limits that will keep the children safe and secure. As children grow toward adolescence, parents need to give them increasing independence and gradually be willing to let them risk success or failure on their own.

Marital satisfaction for most couples tends to decline while the children are in school. Reasons include the financial and emotional pressures of a growing family and the increased job and community responsibilities of parents in their thirties, forties, and fifties. Once the last child has left home, marital satisfaction usually increases because the couple have time to enjoy each other once more.

Single Parents

Today the family life cycle for many women is marriage, motherhood, divorce, single parenthood, remarriage, and widowhood. According to the U.S. Census Bureau, about 27% of all children under 18 live with only one parent (Figure 4.3).

In some single-parent families, the traditional family life cycle is reversed and the baby comes before the marriage. In these families, the single parent is usually a teenage mother; she may very well be black or Hispanic, and she may never get married or may not marry for several years. In 2011 about 55% of all black children were living with a single parent, as were 29% of Hispanic children.

Economic difficulties are the primary problem for single mothers, especially for unmarried mothers who have not finished high school and have difficulty finding work. Divorced

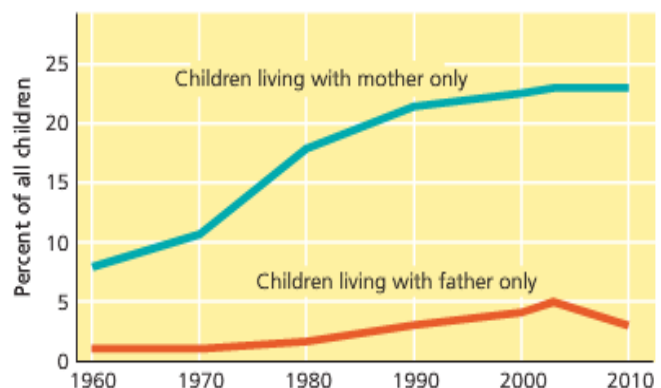


FIGURE 4.3 The growth of single-parent families in the United States, 2010.

SOURCE: U.S. Census Bureau. 2012. *America's Families and Living Arrangements, 2011* (<http://www.census.gov/population/www/socdemo/hh-fam/cps2011.html>).

mothers usually experience a sharp drop in income the first few years on their own, but if they have job skills or education they usually can eventually support themselves and their children adequately. Other problems for single mothers are the often-conflicting demands of playing both father and mother and the difficulty of satisfying their own needs for adult companionship and affection.

Financial pressures are also a complaint of single fathers, but they do not experience them to the extent that single mothers do. Because they are likely to have less practice than mothers in juggling parental and professional roles, they may worry that they do not spend enough time with their children. Because single fatherhood is not as common as single motherhood, however, the men who choose it are likely to be stable, established, and strongly motivated to be with their children.

Research about the effect on children of growing up in a single-parent family is inconclusive. Evidence seems to indicate that these children tend to have less success in school and in their careers than children from two-parent families, but these effects may be associated more strongly with low educational attainment of the single parent than with the absence of the second parent. Two-parent families are not necessarily better if one of the parents spends little time relating to the children or is physically or emotionally abusive.

Stepfamilies

Single parenthood is usually a transitional stage: About three out of four divorced women and about four out of five divorced men will ultimately remarry. Rates are lower for widowed men and women, but overall, almost half the marriages in the United States are remarriages for the husband, the wife, or both. If either partner brings children from a previous marriage into the new family unit, a stepfamily (or “blended family”) is formed.

Stepfamilies are significantly different from primary families and should not be expected to duplicate the emotions and relationships of a primary family. Research has shown that healthy stepfamilies are less cohesive and more adaptable than healthy primary families; they have a greater capacity to allow for individual differences and accept that biologically related family members will have emotionally closer relationships. Stepfamilies gradually gain more of a sense of being a family as they build a history of shared daily experiences and major life events.

Successful Families

Family life can be extremely challenging. A strong family is not a family without problems; it’s a family that copes successfully with stress and crisis (see the box “Strategies of Strong Families”). Successful families are intentionally connected—members share experiences and meanings.

QUICK STATS

4% of American children live in a home where neither parent is present.

—U.S. Census Bureau, 2012

An excellent way to build strong family ties is to develop family rituals and routines—organized, repeated activities that have meaning for family members. Families with regular routines and rituals have healthier children, more satisfying marriages, and stronger family relationships. Some of the most common routines identified in research studies are dinner time, a regular bedtime, and household chores; common rituals include birthdays, holidays, and weekend activities. Family routines may even serve as protective factors, balancing out potential risk factors associated with single-parent families and families with divorce and remarriage. Incorporating a regular family mealtime into a family’s routine allows parents and children to develop closer relationships and leads to better parenting, healthier children, and better school performance.

Although there is tremendous variation in American families, researchers have proposed that six major qualities or themes appear in strong families:

1. *Commitment.* The family is very important to its members. Sexual fidelity between partners is included in commitment.
2. *Appreciation.* Family members care about one another and express their appreciation. The home is a positive place for family members.
3. *Communication.* Family members spend time listening to one another and enjoying one another’s company. They talk about disagreements and attempt to solve problems.
4. *Time together.* Family members do things together—often simple activities that don’t cost money.
5. *Spiritual wellness.* The family promotes sharing, love, and compassion for other human beings.
6. *Coping with stress and crisis.* When faced with illness, death, marital conflict, or other crises, family members pull together, seek help, and use other coping strategies to meet the challenge.

It may surprise some people that members of strong families are often seen at counseling centers. They know that the smartest thing to do in some situations is to get help.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you think of your own family as successful? Why or why not? Either way, what could you do to make your relationships in your family more successful? Are you comfortable talking to your family about these issues?



TAKE CHARGE

Strategies of Strong Families

Life is full of challenges, but strong families work together to meet those challenges. Strong families use the following strategies to deal with life's difficulties:

- *Look for something positive in difficult situations.* No matter how difficult, most problems teach us lessons that we can draw on in future situations.
- *Pull together.* Think of the problem not as one family member's difficulty but as a challenge for the family as a whole.
- *Get help outside the family.* Call on extended family members, supportive friends, neighbors, colleagues, church or synagogue members, and community professionals.
- *Open channels of communication.* We can't meet challenges when communication shuts down.
- *Keep things in perspective.* Remember that "this too shall pass."
- *Be flexible.* Crises often force family members to learn new approaches to life or take on different responsibilities.
- *Focus to minimize fragmentation.* Look at the big picture. Focusing on the details rather than the essentials can make people edgy, even hysterical.
- *Try to worry less.* Worrying itself usually causes more misery than the problem at hand. Sometimes it's best to stuff the worry

down or to resolve to worry 10 minutes a day and then forget about it. The mind simply has to rest.

- *Take care of each other.* We often forget that we are biological beings. Like kindergartners, we need a good lunch and time to play. We need to have our hair stroked, a hug, or a nap.
- *Create a life full of meaning and purpose.* We all face severe crises in life; they're unavoidable. Sometimes it helps to focus on others, to offer service to the community. Giving of ourselves brings richness and dignity to our lives despite the troubles we endure.
- *Actively meet challenges head-on.* Life's disasters do not go away when we look in another direction.
- *Go with the flow to some degree.* Sometimes we are relatively powerless in the face of a crisis. Simply saying to ourselves that things will get better with time can be useful.
- *Be prepared in advance for life's challenges.* Healthy family relationships are like an ample bank balance: If our relational accounts are in order, we will be able to weather life's most difficult storms—together.

SOURCE: Olson, D. H., and J. DeFrain. 2007. *Marriages and Families: Intimacy, Diversity, and Strengths*, 6th ed. New York: McGraw-Hill. Copyright © 2007 The McGraw-Hill Companies, Inc. Reprinted by permission of The McGraw-Hill Companies, Inc.

connect™

Connect to Your Choices

Have you ever thought about why you handle your relationships the way you do? Many factors can influence the relationship choices we make—some not as obvious as others. Do you avoid intimate relationships because you don't want to replicate the patterns you saw in your parents' relationship? Are you frequently disappointed with your relationships because they aren't as blissful or as exciting as the relationships you see in movies or on TV? Do you go along with your partner's ideas because you're not sure what you want?

What are the external factors that influence your choices about relationships? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

A balanced life includes ample time for nourishing relationships with friends, family, and intimate partners.

RIGHT NOW YOU CAN:

- Seek out an acquaintance or a new friend and arrange a coffee date to get to know the person better.
- Call someone you love and tell him or her how important the relationship is to you. Don't wait for a crisis.

IN THE FUTURE YOU CAN:

- Think about the conflicts you have had in the past with your close friends or loved ones and consider how you handled them. Decide whether your conflict management methods were helpful. Using the suggestions in this chapter and Chapter 3, determine how you could better handle similar conflicts in the future.
- Think about your prospects as a parent. What kind of example have your parents set? How do you feel about having children in the future (if you don't have children already)? What can you do to prepare yourself to be a good parent?

SUMMARY

- Healthy intimate relationships are an important component of the well-being of both individuals and society. Many intimate relationships are held together by love.
- Successful relationships begin with a positive sense of self and reasonably high self-esteem. Personal identity, gender roles, and attachment styles are all rooted in childhood experiences.
- Characteristics of friendship include companionship, respect, acceptance, help, trust, loyalty, and reciprocity.
- Love, sex, and commitment are closely linked ideals in intimate relationships. Love includes trust, caring, respect, and loyalty. Sex brings excitement, fascination, and passion to the relationship.
- Common challenges in relationships relate to issues of self-disclosure, commitment, expectations, competitiveness, balancing time together and apart, and jealousy.
- Partners in successful relationships have strong communication skills and support each other in difficult times.
- The keys to good communication in relationships are self-disclosure, listening, and feedback.
- Conflict is inevitable in intimate relationships; partners need to find ways to negotiate their differences.
- People usually choose partners like themselves. If partners are very different, acceptance and good communication skills are especially necessary to maintain the relationship.
- Most Americans find partners through dating or getting together in groups. Cohabitation is a growing social pattern that allows partners to get to know each other intimately without being married.
- Gay and lesbian partnerships are similar to heterosexual partnerships, with some differences. Partners often don't conform to traditional gender roles, and they may experience societal hostility or ambivalence rather than approval of their partnerships.
- Singlehood is a growing option in our society. Advantages include greater variety in sex partners and more freedom in making life decisions; disadvantages include loneliness and possible economic hardship, especially for single women.
- Marriage fulfills many functions for individuals and society. It can provide people with affection, affirmation, and sexual fulfillment; a context for child rearing; and the promise of lifelong companionship.
- Love isn't enough to ensure a successful marriage. Partners must be realistic, feel good about each other, have communication and conflict resolution skills, share values, and balance their individual and joint interests.
- When problems can't be worked out, people often separate and divorce. Divorce is traumatic for all involved, especially children, but the negative effects are usually balanced in time by positive ones.
- At each stage of the family life cycle, relationships change. Marital satisfaction may be lower during the child-rearing years and higher later.

- Many families today are single-parent families. Problems for single parents include economic difficulties, conflicting demands, and time pressures.
- Stepfamilies are formed when single, divorced, or widowed people remarry and create new family units. Stepfamilies gradually gain more of a sense of being a family as they build a history of shared experiences.
- Important qualities of successful families include commitment to the family; appreciation of family members, communication, and time spent together; spiritual wellness; and effective methods of dealing with stress.

FOR MORE INFORMATION

For resources in your area, check your campus directory for a counseling center or peer counseling program, or search online.

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ORGANIZATIONS AND WEBSITES

- American Association for Marriage and Family Therapy*. Provides information about a variety of relationship issues and referrals to therapists.
<http://www.aamft.org>
- Association for Couples in Marriage Enrichment (ACME)*. An organization that promotes activities to strengthen marriage; a resource for books, tapes, and other materials.
<http://www.bettermarriages.org>
- Conflict Resolution Information Source*. Provides links to a broad range of Internet resources for conflict resolution. Information covers interpersonal, marriage, family, and other types of conflicts.
<http://www.crimfo.org>
- Family Education Network*. Provides information about education, safety, health, and other family-related issues.
<http://www.familyeducation.com>

The Gottman Relationship Institute. Includes tips and suggestions for relationships and parenting, including an online relationships quiz. <http://www.gottman.com>

Parents without Partners (PWP). Provides educational programs, literature, and support groups for single parents and their children. Search the online directory for a referral to a local chapter. <http://www.parentswithoutpartners.org>

United States Census Bureau. Provides current statistics on births, marriages, and living arrangements. <http://www.census.gov>

See also the listings for Chapters 3 and 8.

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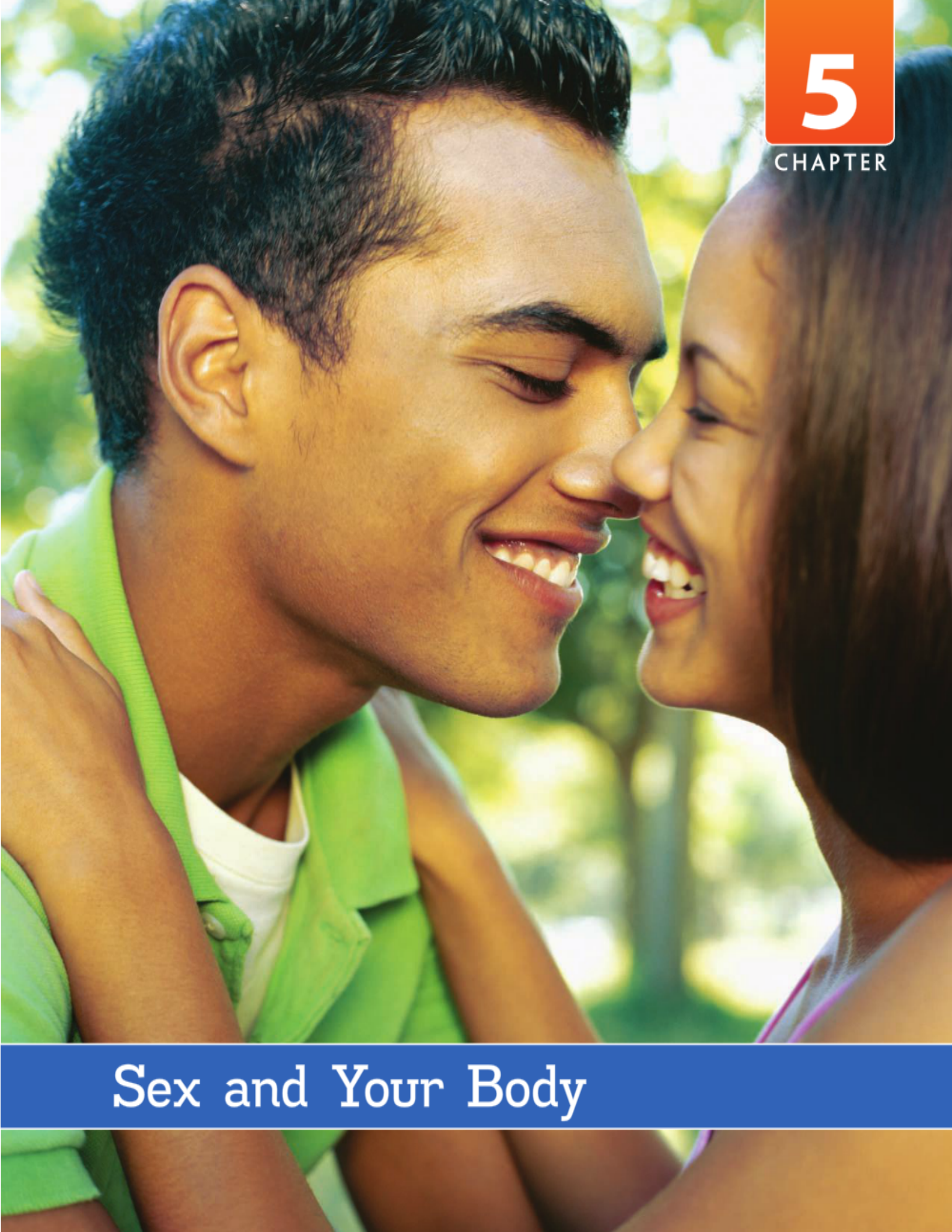
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A close-up photograph of a young man and woman smiling and looking at each other outdoors. The man is on the left, wearing a green shirt, and the woman is on the right, wearing a pink top. They are both smiling broadly, showing their teeth. The background is a soft-focus green, suggesting a park or garden setting.

5

CHAPTER

Sex and Your Body

LOOKING AHEAD...

After reading this chapter, you should be able to

- Describe the structure and function of the female and male sex organs
- Explain the changes in sexual functioning that occur over the course of a person's life
- Describe how the sex organs function during sexual activity
- Identify common causes of sexual problems
- Outline the factors that influence sexual behavior and the various ways human sexuality can be expressed
- Describe guidelines for safe, responsible sexual behavior

TEST YOUR KNOWLEDGE

1. Although testosterone is the primary male hormone, it is also produced in women.
True or false?
2. Which of the following is a risk factor for erectile dysfunction ("impotence")?
 - a. Smoking
 - b. Overweight
 - c. Physical inactivity
3. Calcium supplements may reduce symptoms of premenstrual syndrome (PMS) in some women.
True or false?
4. Alcohol consumption by young people is associated with unplanned, unprotected sexual activity and higher rates of sexually transmitted diseases (STDs).
True or false?

ANSWERS

1. **TRUE.** Testosterone is produced in small amounts by a woman's ovaries.
2. **ALL THREE.** 70–80% of cases of erectile dysfunction are thought to involve physical factors.
3. **TRUE.** Other self-help strategies for PMS include exercise, stress reduction, eating a diet rich in complex carbohydrates, and avoiding alcohol and caffeine.
4. **TRUE.** Studies have shown that raising the drinking age and increasing the price of beer (through taxes) decrease STD rates among young adults.

Humans are sexual beings. Sexual activity is the source of our most intense physical pleasures, a central ingredient in many of our intimate emotional relationships, and the key to reproduction.

Sexuality is more than just sexual behavior. It is a complex, interacting group of biological characteristics and acquired behaviors people learn while growing up in a particular family, community, and society. Sexuality includes biological sex (being biologically male or female), gender (masculine and feminine behaviors), sexual anatomy and physiology, sexual functioning and practices, and social and sexual interactions with others. Our individual sense of identity is powerfully influenced by our sexuality. We think of ourselves in fundamental ways as male or female; as heterosexual or homosexual; as single, attached, married, or divorced.

Basic information about the body, sexual functioning, and sexual behavior is vital to healthy adult life. Once we understand the facts, we have a better basis for evaluating the messages we get and for making informed, responsible choices about our sexual activities. If you have questions about some aspect of your physical sexuality, this chapter will answer them.

SEXUAL ANATOMY

Despite their different appearances, the sex organs of men and women arise from the same structures and fulfill sex-specific but parallel functions. Each person has a pair of **gonads**: ovaries in females and testes in males. The gonads produce **germ cells** and sex hormones. The germ cells are **ova** (eggs) in females and **sperm** in males. Ova and sperm are the basic units of reproduction; their union results in the creation of a new life.

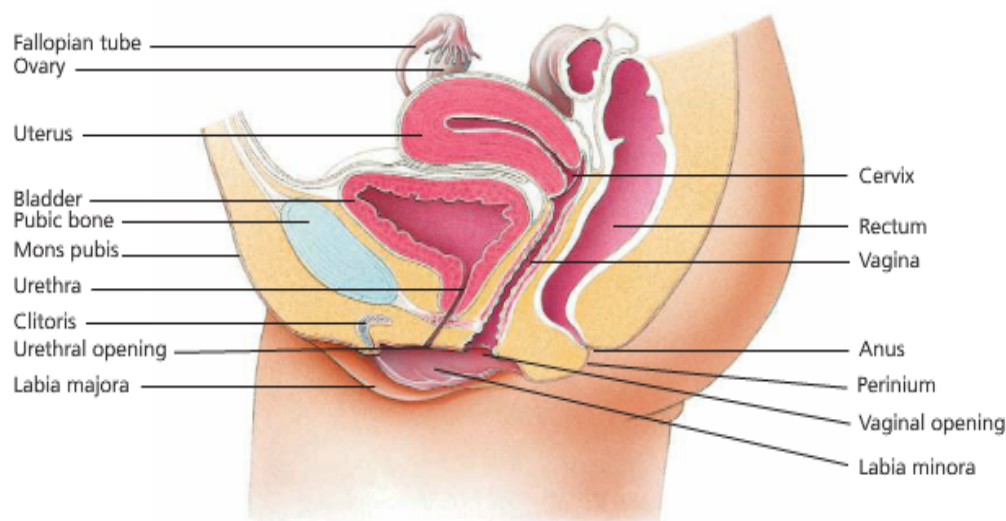


FIGURE 5.1 The female sex organs.

Female Sex Organs

The external sex organs, or genitals, of the female are called the **vulva** (Figure 5.1). The *mons pubis*, a rounded mass of fatty tissue over the pubic bone, becomes covered with hair during puberty (biological maturation). Below it are two paired folds of skin called the *labia majora* (major lips) and the *labia minora* (minor lips). Enclosed within these folds are the clitoris, the opening of the urethra, and the opening of the vagina.

The **clitoris** is highly sensitive to touch and plays an important role in female sexual arousal and orgasm. The clitoris consists of a shaft, glans, and spongy tissue that fills with blood during sexual excitement. The glans is the most sensitive part of the clitoris and is covered by the clitoral hood, or **prepuce**, which is formed from the upper portion of the labia minora.

The female **urethra** is a duct that leads directly from the urinary bladder to its opening between the clitoris and the opening of the vagina. The urethra conducts urine from the bladder to the outside of the body. The female urethra is not part of the reproductive tract.

The **vagina** is the passage that leads to the internal reproductive organs. It is the female structure for heterosexual sexual intercourse and serves as the birth canal. Projecting into the upper part of the vagina is the **cervix**, which is the opening of the **uterus**—or *womb*—where a fertilized egg is implanted and grows into a *fetus*.

A pair of **fallopian tubes** (or *oviducts*) extends from the top of the uterus. The end of each oviduct surrounds an **ovary** and guides the mature ovum down into the uterus after the egg exits the ovary.

Male Sex Organs

A man's external sex organs, or genitals, are the penis and the scrotum (Figure 5.2).

The **penis** consists of spongy tissue that becomes engorged with blood during sexual excitement, causing the organ to enlarge and become erect.

The **scrotum** is a pouch that contains a pair of sperm-producing male gonads, called **testes**. The scrotum maintains the testes at a temperature approximately 5°F below that of the

sexuality A dimension of personality shaped by biological, psychosocial, and cultural forces and concerning all aspects of sexual behavior.

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gonads The primary reproductive organs that produce germ cells and sex hormones: the ovaries and testes.

germ cells Sperm and ova (eggs).

ovum A germ cell produced by a female, which combines with a male germ cell (sperm) to create a fetus; plural, *ova*. Also called an *egg*.

sperm A germ cell produced by a male, which combines with a female germ cell (ovum) to create a fetus.

vulva The external female genitals, or sex organs.

clitoris The highly sensitive female genital structure.

prepuce The foreskin of the clitoris or penis.

urethra The duct that carries urine from the bladder to the outside of the body.

vagina The passage leading from the female genitals to the internal reproductive organs; the birth canal.

cervix The opening of the uterus in the upper part of the vagina.

uterus The hollow, thick-walled, muscular organ in which the fertilized egg develops; the *womb*.

fallopian tube A duct that guides a mature ovum from the ovary to the uterus; also called an *oviduct*.

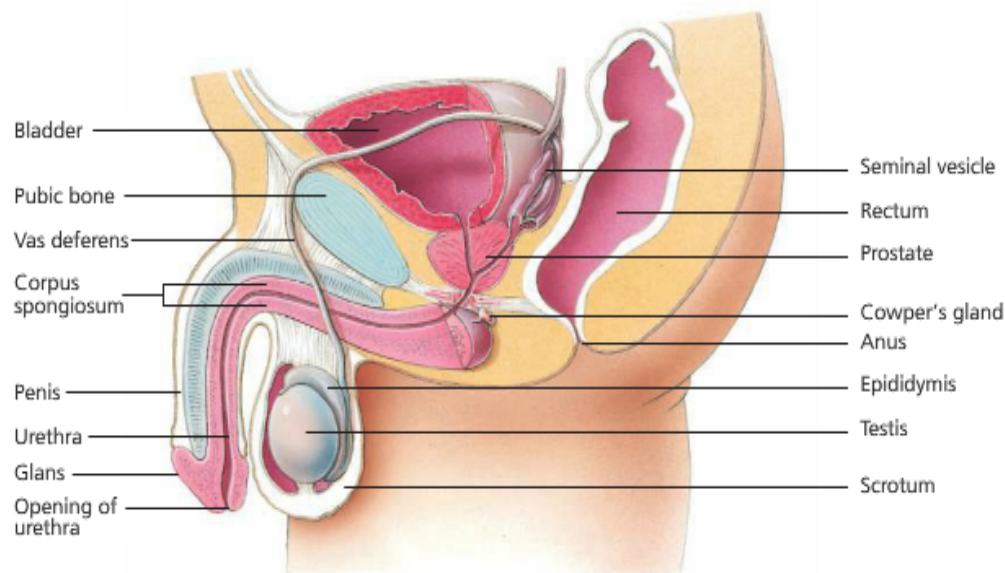
ovaries The paired female reproductive glands that produce ova (eggs) and sex hormones; ovaries are the female gonads.

penis The male genital structure consisting of spongy tissue that becomes engorged with blood during sexual excitement.

scrotum The loose sac of skin and muscle fibers that contains the testes.

testis One of two male gonads, the site of sperm production; plural, *testes*. Also called *testicle*.

FIGURE 5.2 The male sex organs.



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rest of the body—that is, at about 93.6°F. The process of sperm production is extremely heat-sensitive. In hot temperatures, the muscles in the scrotum relax and the testes move away from the heat of the body. This ability to regulate the temperature of the testes is important because elevated testicular temperature can interfere with normal sperm production.

The male urethra is a tube that runs through the entire length of the penis. The urethra carries both urine and **semen** (sperm-carrying fluid) to the opening at the tip of the penis. Although urine and semen share a common passage, they are prevented from mixing together by muscles that control their entry into the urethra.

During its brief lifetime, a sperm takes the following route:

1. Sperm are produced inside a maze of tiny, tightly packed tubules within the testes. As they begin to mature, sperm flow into a single storage tube called the **epididymis**, which lies on the surface of each testis.
2. Sperm move from each epididymis into another tube—called the **vas deferens**—which carries them upward into the abdominal cavity and through an organ called the **prostate gland**. This gland produces some of the fluid in semen, which helps transport and nourish the sperm.
3. The two *vasa deferentia* eventually merge into a pair of **seminal vesicles**, whose secretions provide nutrients for the semen.
4. On the final stage of their journey, sperm flow into the **ejaculatory ducts**, which join the urethra.

The **Cowper's glands** are two small structures flanking the urethra. During sexual arousal, these glands secrete a clear, mucouslike fluid that appears at the tip of the penis. Preejaculatory

QUICK STATS

20 million or more sperm per milliliter of semen is considered a normal sperm count.

—Mayo Clinic
(www.mayoclinic.com), 2010

fluid is thought to help lubricate the urethra to facilitate the passage of sperm. Preejaculatory fluid may contain sperm, so withdrawal of the penis before ejaculation is not a reliable form of contraception.

The smooth, rounded tip of the penis is the highly sensitive **glans**, an important component in sexual arousal (Figure 5.3). The glans is partially covered by the foreskin, or prepuce, a retractable fold of skin that is removed by **circumcision** in about 55% of newborn males in the United States.

Circumcision is performed for cultural, religious, and hygienic reasons. Rates of circumcision vary widely among different groups (see the box “Genital Alteration”).

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semen The fluid that carries sperm out of the male penis during ejaculation.

epididymis A storage duct for maturing sperm, located on the surface of each testis.

vas deferens A tube that carries sperm from the epididymis through the prostate gland to the seminal vesicles; plural, *vasa deferentia*.

prostate gland A male reproductive organ; produces some of the fluid in semen, which helps transport and nourish sperm.

seminal vesicle A tube leading from the vas deferens to the ejaculatory duct; secretes nutrients for the semen.

ejaculatory duct A tube that carries mature sperm to the urethra so they can exit the body upon ejaculation.

Cowper's gland In the male reproductive system, a small organ that produces preejaculatory fluid.

glans The rounded head of the penis or the clitoris.

circumcision Surgical removal of the foreskin of the penis.

DIVERSITY MATTERS

Genital Alteration



Many societies have a tradition of altering the appearance and function of their children's genitalia, either shortly after birth or as part of a puberty rite. Such cultural customs can seem strange, and sometimes even barbaric, to those who are not part of that particular culture. Male circumcision and female genital cutting are both examples of genital alteration, and both are subjects of considerable controversy.

The most common form of genital alteration worldwide is male circumcision—the removal of the foreskin of the penis. Circumcision is a relatively minor surgical procedure that is performed for a variety of cultural, religious, aesthetic, and medical reasons. Worldwide an estimated one-third of males are circumcised. In the United States a little more than one-half of male newborns are circumcised (from a high of nearly 90% in the 1960s); over time, fewer American parents are having their sons circumcised.

Currently no major medical group in the United States recommends the routine circumcision of male infants. The procedure, though minor, carries some medical risks, including bleeding, infection, and damage to the penis. Circumcision causes pain to the infant, although most pain can be alleviated with appropriate use of local anesthetic. Circumci-

sion may change the sensitivity of the penis, and some critics claim that it can diminish a man's sexual pleasure. Opponents of circumcision point to the fact that most of the world's men are uncircumcised; why perform surgery, they ask, when there is no clear need for it?

On the other side of the debate, there are a number of health benefits of circumcision. Citing research findings, proponents argue that it promotes cleanliness and reduces the risk of urinary tract infections in newborns and the risk of sexually transmitted diseases, including HIV, later in life, as well as the risk of penile cancer. Studies conducted in developing countries have shown that circumcision can reduce a man's risk of acquiring HIV through heterosexual contact by as much as 60%. However, STD education and the practice of abstinence or low-risk sexual behaviors have a far greater impact on the transmission of STDs than does circumcision.

Far more controversial is the practice of female genital cutting (FGC), also called female genital mutilation. There are no medical or health reasons to perform these procedures, which range from removal of the external genitalia (including the clitoris and labia) to narrowing of the vaginal opening with a surgically created seal to less drastic forms of harm to the

genitalia. These practices were probably originally developed to control a woman's sexuality and ensure that she remained a virgin before marriage.

Each year about 3 million female children undergo FGC, usually between infancy and age 15, and about 140 million women worldwide are estimated to have had some form of genital cutting. FGC is often performed under unsterile conditions and without adequate anesthesia. Serious complications are common and include severe pain, infection, bleeding, and death. Common long-term health issues include infertility, difficulties with childbirth, and problems with urinary and sexual function.

The World Health Organization has come out strongly against FGC, declaring it a violation of the human rights of girls and women. FGC is now illegal in many countries, but it is still performed on large numbers of girls where the cultural tradition persists.

SOURCE: Centers for Disease Control and Prevention. 2011. Trends in in-hospital newborn male circumcision—United States, 1999–2010. *Morbidity and Mortality Weekly Report* 60(34): 1167–1168; World Health Organization. 2012. *Female Genital Mutilation* (http://www.who.int/topics/female_genital_mutilation/en/).

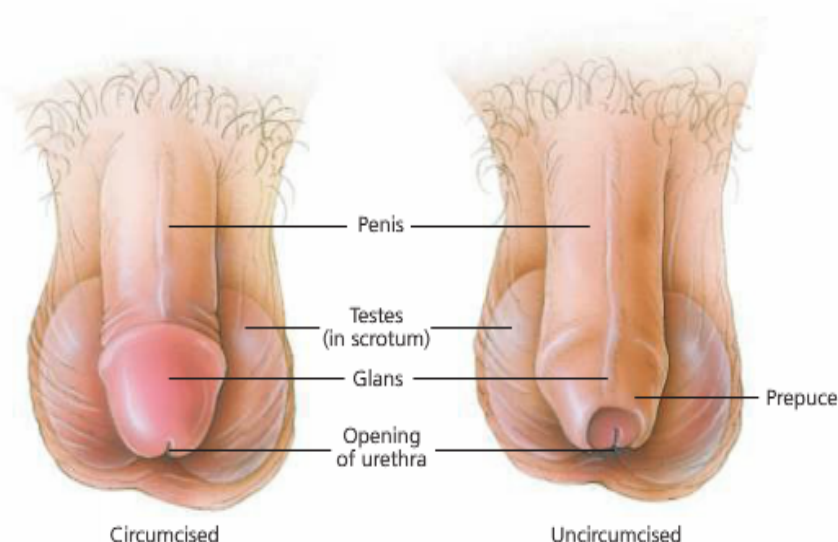


FIGURE 5.3 Circumcised and uncircumcised penis.

HORMONES AND THE REPRODUCTIVE LIFE CYCLE

The sex hormones produced by the ovaries or testes have a major influence on the development and function of the reproductive system throughout life. In addition to their effects on the reproductive organs, sex hormones influence many other organs in the body, including the brain.

The male sex hormones, made by the testes, are called **androgens**, the most important of which is *testosterone*. The female sex hormones, produced by the ovaries, belong to two groups: **estrogens** and **progestagens**, the most important of which is *progesterone*. The ovaries also produce a small amount of testosterone. The **adrenal glands** also produce sex hormones in both males and females.

Sex hormones are regulated by the hormones of the **pituitary gland**, located at the base of the brain. This gland in turn is controlled by hormones produced by the **hypothalamus** in the brain.

Substances that act like hormones and disrupt normal endocrine activity, particularly activity related to reproduction and development, are also found in the environment. The most studied endocrine-disrupting chemicals, or EDCs, are environmental estrogens, which mimic the female sex hormone estrogen and can duplicate or exaggerate its effects. Other EDCs can block estrogen, mimic or block androgens (male sex hormones), or otherwise alter hormonal responses in the body.

Differentiation of the Embryo

An individual's biological sex is determined by the fertilizing sperm at the time of conception. All human cells normally contain 23 pairs of chromosomes (Figure 5.4). In 22 of the pairs, the two partner chromosomes match. But in the 23rd pair, the **sex chromosomes**, two configurations are possible. Individuals with two matching X chromosomes are female, and individuals with one X and one Y chromosome are male. Thus at the time of conception the genetic sex is established: females are XX and males are XY.

Abnormalities sometimes occur in the sex chromosomes; the two most common disorders of sex chromosomes are Klinefelter's syndrome and Turner's syndrome. Klinefelter's syndrome, a condition where a male carries two or more X chromosomes in addition to the Y chromosome, occurs in about 1 in 1000 males and causes infertility and small genitalia. Turner's syndrome occurs in about 1 in 2500 females. Women with Turner's have only a single complete X chromosome. These women are usually not able to have children and can sometimes have other medical problems.

Genetic sex dictates whether the undifferentiated gonads become ovaries or testes. If a Y chromosome is present, the gonads become testes and produce the male hormone **testosterone**. Testosterone circulates throughout the body and

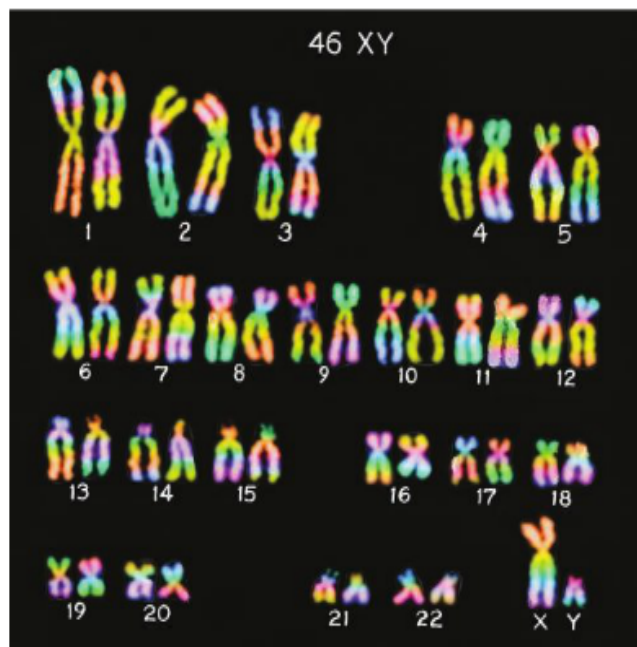


FIGURE 5.4 A normal set of chromosomes. The first 22 pairs are matched, but the last pair (the sex chromosomes) do not match, meaning the person carrying these chromosomes is male.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your personal views on circumcision? Who or what has influenced those opinions? Are the bases of your views primarily cultural, moral, or medical?

androgens Male sex hormones, produced by the testes.

estrogens A class of female sex hormones, produced by the ovaries, that bring about sexual maturation at puberty and maintain reproductive functions.

progestagens A class of female sex hormones, produced by the ovaries, that sustain reproductive functions.

adrenal glands Endocrine glands, located over the kidneys, that produce sex hormones.

pituitary gland An endocrine gland at the base of the brain that produces hormones and regulates the release of hormones—including sex hormones—by other glands.

hypothalamus A region of the brain above the pituitary gland whose hormones control the secretions of the pituitary; also involved in the control of many bodily functions, including hunger, thirst, temperature regulation, and sexual functions.

sex chromosomes The X and Y chromosomes, which determine an individual's biological sex.

testosterone The most important male sex hormone; stimulates an embryo to develop into a male and induces the development of male secondary sex characteristics during puberty.

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causes the undifferentiated reproductive structures to develop into male sex organs (penis, scrotum, and others). If a Y chromosome is not present, there is no testosterone; the gonads become ovaries and the reproductive structures develop into female sex organs (clitoris, labia, and others). The entire process is known as *sexual differentiation*.

Exposure to hormones affects more than just the reproductive organs; it also influences development of the brain. It has been demonstrated many times that males tend to perform better than females at tasks requiring spatial skills and females perform better than males on tests of verbal skills. If androgens are involved in this gender difference, we would expect genetic females exposed to androgens to do better at spatial skills and genetic males deprived of androgens to do worse—and this is exactly what we find.

However, it is important to keep in mind that each person is the product of biological events that act upon the cells in the body, including the brain. The physical and social environment then shapes this biological foundation to produce unique individuals. Some researchers point to the human past as a way to explain sex differences in language and visual-spatial skills. For example, the early division of labor with men as hunters and women as food gatherers, camp organizers, and child raisers may have selected for different skills based on gender, including visual-spatial skills in men and communication skills in women.

Female Sexual Maturation

Although humans are fully sexually differentiated at birth, the differences between males and females are accentuated at **puberty**, the period during which the reproductive system matures, secondary sex characteristics develop, and the bodies of males and females begin to appear more distinctive. The changes of puberty are induced by testosterone in the male and estrogen and **progesterone** in the female.

Puberty in Females The first sign of puberty in girls is breast development, followed by a rounding of the hips and buttocks. As the breasts develop, hair appears in the pubic region and later in the underarms. Shortly after the onset of breast development, girls show an increase in growth rate. Breast development usually begins between ages 8 and 13, and the time of rapid body growth occurs between ages 9 and 15.

The Menstrual Cycle A major landmark of puberty for young women is the onset of the **menstrual cycle**, the monthly ovarian cycle that leads to menstruation (loss of blood and tissue lining the uterus) in the absence of pregnancy. The timing of **menarche** (the first *menstrual period*) varies with several factors, including ethnicity, genetics, and nutritional status. The “normal” range for the onset of menstruation is wide; some girls experience menarche as young as 9 or 10, and others



Once they reach puberty, these adolescents are biologically adults, but it will take several more years for them to become adults in social and psychological terms.

when they are 16 or 17 years old. The current average age of menarche in the United States is around 12 and a half years of age. Two hundred years ago, the average age of menarche was closer to 17 years. The earlier onset of menarche today is probably due in large part to nutritional factors. When age at menarche is examined worldwide, studies show that menarche tends to come later to girls who live in relative poverty with

puberty The period of biological maturation during adolescence; in this stage of development, the individual becomes capable of sexual reproduction.

progesterone The most important female sex hormone; regulates the menstrual cycle and sustains pregnancy.

menstrual cycle The monthly ovarian cycle, regulated by hormones; in the absence of pregnancy, menstruation occurs.

menarche The first menstrual period, experienced by most young women at some point during adolescence.

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diets lacking in protein and calories. Obesity is strongly correlated with earlier menarche, which may explain the current trend for earlier menarche in the United States and many other countries. Some experts worry that exposure to estrogen-like chemicals in the environment may also be contributing to earlier menarche.

The day of the onset of bleeding is considered to be day 1 of the menstrual cycle. For the purposes of our discussion, a cycle of 28 days will be used; however, normal cycles vary in length from 21 to 35 days. The menstrual cycle consists of the following four phases (Figure 5.5):

1. MENSES During **menses**, characterized by the menstrual flow, blood levels of hormones from the ovaries and the pituitary gland are relatively low. This phase of the cycle usually lasts from day 1 to about day 5.

2. ESTROGENIC PHASE The estrogenic phase begins when the menstrual flow ceases and the pituitary gland begins to produce increasing amounts of follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Under the influence of FSH, an egg-containing ovarian **follicle** begins to mature, producing increasingly higher amounts of estrogen. Stimulated by estrogen, the **endometrium** (the uterine lining) thickens with large numbers of blood vessels and uterine glands.

3. OVULATION A surge of a potent estrogen called *estradiol* from the follicle causes the pituitary to release a large burst of LH and a smaller amount of FSH. The high concentration of LH stimulates the developing follicle to release its ovum. This event is known as **ovulation**. After ovulation, the follicle is

transformed into the **corpus luteum**, which produces progesterone and estrogen. Ovulation theoretically occurs about 14 days prior to the onset of menstrual flow, with the window of greatest fertility occurring from a few days before ovulation to about one day after. This information has been used to attempt to predict the most fertile time during the menstrual cycle for

fertility treatments and natural family planning methods (see Chapter 6). However, a recent study showed that even women with regular menstrual cycles often have unpredictable ovulation, and can actually be fertile on any day of the month, including during menstruation. The “window of fertility” is especially unpredictable in teenagers and women who are approaching menopause.

4. PROGESTATIONAL PHASE During the progestational phase of the cycle, the amount of progesterone secreted from the corpus luteum increases and remains high until the onset of the next menses. Under the influence of estrogen and progesterone, the endometrium continues to develop, readying itself to receive and nourish a fertilized ovum. When pregnancy occurs, the fertilized egg produces the hormone human chorionic gonadotropin (HCG), which maintains the corpus luteum. Thus levels of ovarian hormones remain high and the uterine lining is preserved, preventing menses.

If pregnancy does not occur, the corpus luteum degenerates, and estrogen and progesterone levels gradually fall. Below certain hormonal levels, the endometrium can no longer be maintained, and it begins to slough off, initiating menses. As the levels of ovarian hormones fall, a slight rise in LH and FSH occurs, and a new menstrual cycle begins.

Menstrual Problems Menstruation is a normal biological process, but physical and/or emotional symptoms associated with the menstrual cycle are very common. Many women experience menstrual cramps, the severity of which tends to vary from cycle to cycle. **Dysmenorrhea**, discomfort associated with menstruation, can include any combination of the following symptoms: lower abdominal cramps, backache, vomiting, nausea, bloating, diarrhea, headache, and fatigue. Many of these symptoms can be attributed to uterine muscular contractions caused by chemicals called *prostaglandins*. Nonsteroidal anti-inflammatory drugs (NSAIDs) such

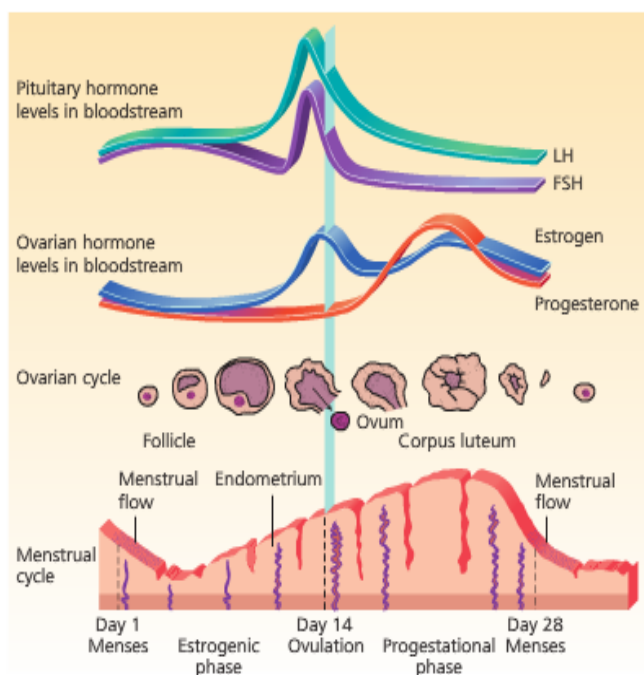


FIGURE 5.5 The menstrual cycle.

Some women, even with predictable menstrual cycles, can be fertile any day of the month.

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menses The portion of the menstrual cycle characterized by menstrual flow.

follicle A saclike structure within the ovary, in which an egg (ovum) matures.

endometrium The lining of the uterus.

ovulation The release of a mature egg (ovum) from an ovary.

corpus luteum The part of the ovarian follicle left after ovulation, which secretes estrogen and progesterone during the second half of the menstrual cycle.

dysmenorrhea Painful or problematic menstruation.

as ibuprofen (Motrin, Advil) block the effects of prostaglandins and are often effective in relieving dysmenorrhea. Oral contraceptives are also effective in reducing dysmenorrheal symptoms in most women.

Many women experience transient emotional symptoms prior to the onset of their menstrual flow. Depending on their severity, these symptoms may be categorized along a continuum: **premenstrual tension**, **premenstrual syndrome (PMS)**, and **premenstrual dysphoric disorder (PMDD)**. Premenstrual tension symptoms are mild and may include negative mood changes and physical symptoms such as abdominal cramping and backache. More severe symptoms are classified as PMS; very severe symptoms that impair normal daily and social functioning are classified as PMDD. All three conditions share a definite pattern. Symptoms appear prior to the onset of menses and disappear within a few days after the start of menstruation. Premenstrual tension is quite common, PMS affects about 1 in 5 women, and PMDD affects fewer than 1 in 10 women.

Symptoms associated with PMS and PMDD can include breast tenderness, water retention (bloating), headache, fatigue, insomnia or excessive sleep, appetite changes, food cravings, irritability, anger, increased interpersonal conflict, depression, anxiety, tearfulness, inability to concentrate, social withdrawal, and the sense of being out of control or overwhelmed.

Despite many research studies, the causes of PMS and PMDD are still unknown, and it is unclear why some women are more vulnerable than others. Research has focused on a variety of substances in the body that may fluctuate with the menstrual cycle. Most researchers feel that PMS is probably caused by a combination of hormonal, neurological, genetic, dietary, and psychological factors.

The following strategies provide relief for many women with premenstrual symptoms, and all of them can contribute to a healthy lifestyle at any time:

- **Limit salt intake.** Salt promotes water retention and bloating.
- **Exercise.** Women who exercise may experience fewer symptoms before and after menstrual periods.
- **Don't use alcohol or tobacco.** Alcohol and tobacco may aggravate certain symptoms of PMS and PMDD.
- **Eat a nutritious diet.** Choose a low-fat diet rich in complex carbohydrates from vegetables, fruits, and whole-grain breads, cereals, and pasta. Get enough calcium from calcium-rich foods and, if needed, supplements. Minimize your intake of sugar and caffeine, and avoid chocolate, which is rich in both.
- **Relax.** Stress reduction is always beneficial, and stressful events can trigger PMS symptoms. Try relaxation techniques during the premenstrual time.

If you're a female with persistent premenstrual symptoms, keep a daily diary to track the types of symptoms, their sever-

QUICK STATS

75% of women experience premenstrual symptoms during their childbearing years.

—National Institutes of Health, 2012

ity, and how they correlate with your menstrual cycle. See your physician for an evaluation and to learn about treatments that are available only by prescription.

Selective serotonin reuptake inhibitors (SSRIs), such as Prozac and Zoloft, are often used to treat PMS and PMDD. Until recently, women using SSRIs took the medication throughout the entire menstrual cycle, but taking the medication during just the progestational phase of the cycle is effective in some women.

Other drug treatments for PMS and PMDD include certain oral contraceptives, diuretics to minimize water retention, and NSAIDs such as ibuprofen. A number of vitamins, minerals, and other dietary supplements have also been studied for PMS relief. Only one supplement, calcium, has been shown to provide relief in rigorous clinical studies; several others show promise, but more research is needed.

Male Sexual Maturation

Reproductive maturation of boys occurs about two years later than that of girls; it usually begins at about age 10 or 11 (Figure 5.6).

Testicular growth is usually the first obvious sign of sexual maturity in boys. The penis also grows at this time, reaching adult size by about age 18. Pubic hair starts to develop after the genitals begin increasing in size, with underarm and facial hair gradually appearing. Hair on the chest, back, and abdomen increases later in development. Facial hair often continues to get thicker and darker for several years after puberty. The voice deepens as a result of the lengthening and thickening of the vocal cords. A small amount of breast development occurs in many boys during puberty. This is called *gynecomastia*, and it usually decreases after puberty. Excessive breast growth can occur in some boys, especially if they are overweight.

Boys grow taller for about six years after the first signs of puberty, with a very rapid period of growth about two years after puberty starts. Largely because of the influence of testosterone, muscle development and bone density are much greater in males than in females. By adulthood, men on average have one and a half times the lean body mass of women, and nearly half the body fat.

premenstrual tension Mild physical and emotional changes associated with the time before the onset of menses.

premenstrual syndrome (PMS) A disorder characterized by physical discomfort, psychological distress, and behavioral changes that begin after ovulation and cease when menstruation begins.

premenstrual dysphoric disorder (PMDD) A severe form of PMS, characterized by symptoms serious enough to interfere with daily activities and relationships.

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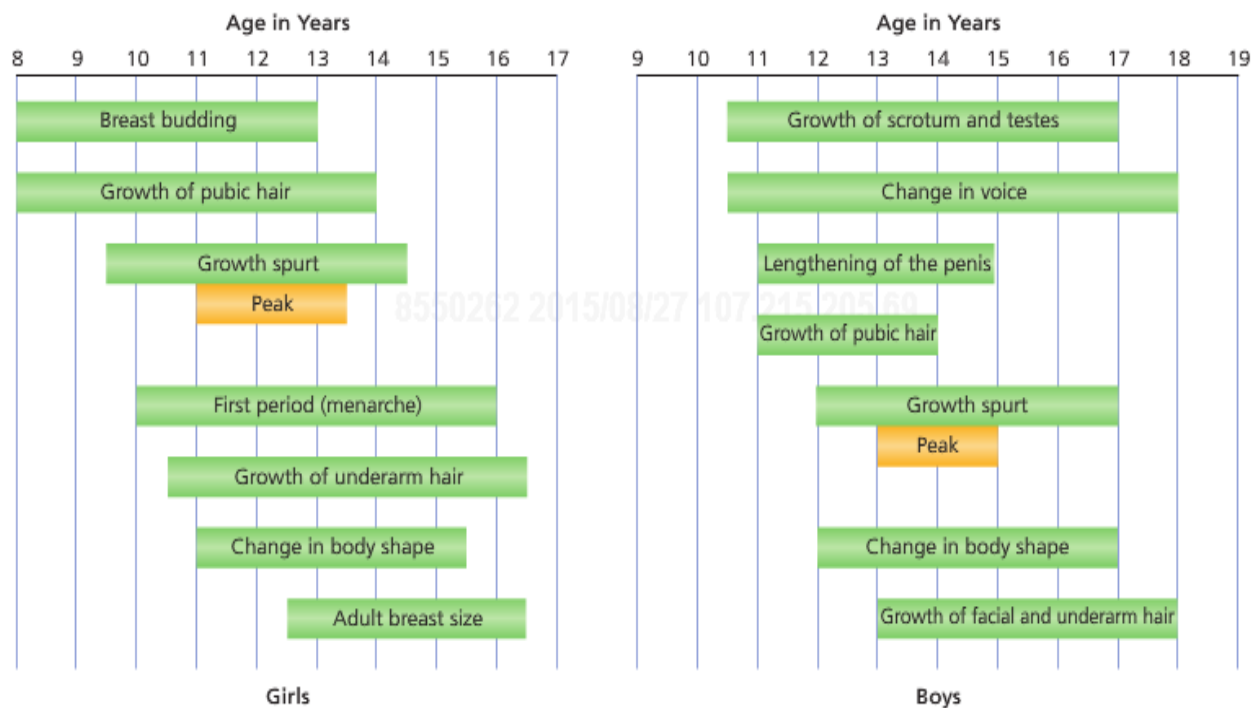


FIGURE 5.6 Milestones in sexual maturation of girls and boys. Reprinted with permission from *The Merck Manual Home Health Handbook, Online Version*. © 2010–2011 Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, N.J., U.S.A. http://www.merckmanuals.com/home/childrens_health_issues/adolescents/physical_and_sexual_development.html

Aging and Human Sexuality

Hormone production and sexual functioning change as we age. Sexual “performance” may diminish, but sexuality and sensuality can continue to be a source of great pleasure and satisfaction. A recent study of sexuality in older Americans found that three-fourths of 57- to 64-year-olds were sexually active (defined as having had at least one sexual partner in the last year). Half of those ages 65–74, and about one-fourth of people ages 75–85, remained sexually active. People who remain healthy and

active are much more likely to continue to be sexually active in their older years.

Menopause As a woman approaches age 50, her ovaries gradually cease to function and she enters **menopause**, the cessation of menstruation (Table 5.1). For some women, the

menopause The cessation of menstruation, occurring gradually around age 50.

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Table 5.1 Reproductive Aging in Women

	REPRODUCTIVE YEARS			MENOPAUSAL TRANSITION			POSTMENOPAUSE
	FIRST PERIOD			FINAL PERIOD			
Average Age*	9–15	16–30	31–42	Early transition 40s	Late transition late 40s, early 50s	51	50s and beyond
Menstrual Cycles	Variable	Regular	Regular	Lengths of cycles vary increasingly	2 or more skipped periods	No period**	No periods
Signs and Symptoms			Fertility progressively declining		Hot flashes, irritability, and sleep disturbance; bone loss begins	Same as previous	Vaginal dryness, bone loss. Hot flashes can persist. For a few women, hot flashes continue into their 60s and 70s

*These are average ages. Women vary a great deal in the ages at which they go through these stages.
 **Menopause is said to have occurred after 12 months without a period.

SOURCE: Copyright © 2007 by the American Society for Reproductive Medicine. Reproduced with permission.

associated drop in hormone production causes troublesome symptoms. The most common physical symptom of menopause is the hot flash, a sensation of warmth rising to the face from the upper chest, with or without perspiration and chills. During a hot flash, skin temperature can rise by more than 10 degrees. Other menopausal symptoms can include night sweats, insomnia, vaginal dryness, thinning of head hair, and mood changes. Osteoporosis—decreasing bone density—can develop, making older women more vulnerable to fractures.

As a result of decreased estrogen production during menopause, the vaginal walls become thin and lubrication in response to sexual arousal diminishes. Sexual intercourse may become painful. Hormonal treatment or the use of lubricants during intercourse can minimize these problems.

Doctors have known for decades that most of the symptoms of menopause can be relieved with the administration of estrogen. It became common for postmenopausal women to take estrogen for relief from hot flashes, vaginal dryness, bone loss, and a host of other symptoms. However, doctors discovered that giving estrogen alone to postmenopausal women resulted in higher rates of endometrial cancer. To alleviate this problem, it became customary to prescribe estrogen with a progestagen (called *hormone therapy*, or *HT*), since this combination reduced the risk for uterine cancer but still reduced menopausal symptoms. The medical community was taken by surprise in 2002 when a large study showed that women taking a common form of estrogen/progestagen therapy had higher rates of cardiovascular disease, blood clots, and breast cancer than postmenopausal women not taking hormones. Prescriptions for hormone therapy plummeted after this news. Breast cancer rates dropped over the next few years, but experts are not sure whether the decline in breast cancer was due to the decrease in hormone therapy or to other factors.

In the last several years, reanalysis of the data and information from newer studies has resulted in a more individualized approach to hormone therapy. It appears that younger women who have just become menopausal are more likely to benefit from hormone therapy and less likely to have serious side effects than older women. Current forms of hormone therapy include low-dose estrogen, sometimes in the form of a patch, cream, or vaginal ring, designed to treat specific symptoms of menopause but with a reduced risk of side effects. (See Chapters 12, 15, and 22 for more information about osteoporosis, heart disease, and HT.)

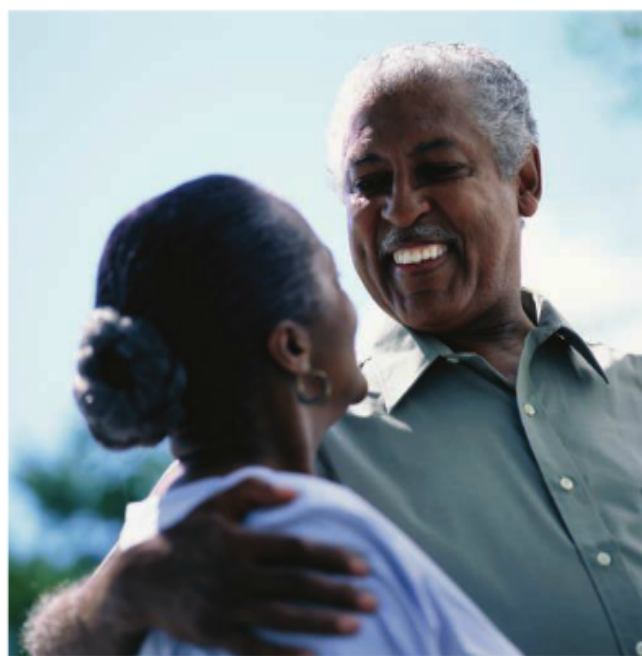
Aging Male Syndrome Between the ages of 35 and 65, men experience a gradual decline in testosterone production resulting in the aging male syndrome, sometimes referred to as *male menopause* or *andropause*. Some experts prefer the term *aging male syndrome* because the process is much more

Men over 40 are more likely to produce children with health problems such as autism, schizophrenia, and Down syndrome.

gradual than female menopause. Symptoms vary widely, but most men experience at least some of the following symptoms as they age: loss of muscle mass, increased fat mass, decreased sex drive, erectile problems, depressed mood, irritability, difficulties with concentration, increased urination, loss of bone mineral density, and sleep difficulties. In some cases, testosterone replacement therapy can help. Although taking testosterone can be harmful in young healthy men, older men with low testosterone levels may benefit from carefully prescribed testosterone treatment.

As men get older, they depend more on direct physical stimulation for sexual arousal. They take longer to achieve an erection and find it more difficult to maintain; orgasmic contractions are less intense. Older men with erectile dysfunction are often prescribed medications such as Viagra that increase blood flow to the penis, resulting in a firmer erection.

Unlike women, who are born with all the eggs they will ever have and stop being fertile at menopause, men continue to produce sperm throughout their lives and can sometimes father children well into their eighties and even nineties. Starting at about age 30, however, men become gradually less fertile. Regardless of the age of their female partners, couples in which the male is over age 35 have a 50% lower pregnancy rate than couples in which the man is 30 years old or younger. Men over age 40 are more likely to produce children with health problems such as autism, schizophrenia, and Down syndrome.



Although sexual physiology changes as people get older, many men and women readily adjust to these alterations.

SEXUAL FUNCTIONING

In this section, we discuss sexual physiology—how the sex organs function during sexual activity—and problems that can occur with sexual functioning. Sexual activity is based on stimulus and response. Erotic stimulation leads to sexual arousal (excitement), which may culminate in the intensely pleasurable experience of orgasm. But sexual activity should not be thought of only in terms of the sex organs. Responses to sexual stimulation involve not just the genitals but the entire body and mind.

Sexual Stimulation

Sexual excitement can come from many sources, both physical and psychological. Although physical stimuli have an obvious and direct effect, some people believe psychological stimuli—thoughts, fantasies, desires, perceptions—are even more powerfully erotic. Regardless of the source of erotic stimuli, all stimulation has a physical basis, which is given meaning by the brain.

Physical Stimulation Physical stimulation comes through the senses: we are aroused by things we see, hear, taste, smell, and feel. Most often, sexual stimuli come from other people, but they may also come from books, photographs, paintings, songs, films, or other sources.

The most obvious and effective physical stimulation is touching. Even though culturally defined practices vary and different people have different preferences, most sexual encounters eventually involve some form of touching with hands, lips, and body surfaces. Kissing, caressing, fondling, and hugging are as much a part of sexual encounters as they are a part of expressing affection.

The most intense form of stimulation by touching involves the genitals. The clitoris and the glans of the penis are particularly sensitive to such stimulation. Other highly responsive areas include the vaginal opening, the nipples, the breasts, the insides of the thighs, the buttocks, the anal region, the scrotum, the lips, and the earlobes. Such sexually sensitive areas, or erogenous zones, are especially susceptible to sexual arousal for most people, most of the time. Often, though, what determines the response is not *what* is touched but how, for how long, and by whom. Under the right circumstances, touching any part of the body can cause sexual arousal.

Psychological Stimulation Sexual arousal also has an important psychological component, regardless of the nature of the physical stimulation. Fantasies, ideas, memories of past experiences, and mood can all generate sexual excitement. Erotic thoughts may be linked to an imagined person or situation or to a sexual experience from the past. Fantasies may involve activities a person may not actually wish to experience in reality, usually because they're dangerous, frightening, or forbidden.

Arousal is also powerfully influenced by emotions. How you feel about a person and how the person feels about you matter tremendously in how sexually responsive you are likely

to be. Even the most direct forms of physical stimulation carry emotional overtones. Kissing, caressing, and fondling express affection and caring. The emotional charge they give to a sexual interaction is at least as significant to sexual arousal as the purely physical stimulation achieved by touching.

The Sexual Response Cycle

Men and women respond physiologically with a predictable set of reactions, regardless of the nature of the stimulation (Figure 5.7).

Two physiological mechanisms explain most genital and bodily reactions during sexual arousal and orgasm. These mechanisms are vasocongestion and muscular tension. **Vasocongestion** is the engorgement of tissues that results when more blood flows into an organ than is flowing out. Thus the penis becomes erect on the same principle that makes a garden hose become stiff when the water is turned on. Increased muscular tension culminates in rhythmical muscular contractions during orgasm.

Four phases characterize the sexual response cycle:

1. In the *excitement phase*, the penis becomes erect as its tissues become engorged with blood. The testes expand and are pulled upward within the scrotum. In women, the clitoris, labia, and vaginal walls are similarly engorged with blood. Tension increases in the vaginal muscles, and the vaginal walls become moist with lubricating fluid.
2. The *plateau phase* is an extension of the excitement phase. Reactions become more marked. In men, the penis becomes harder, and the testes become larger. In women, the lower part of the vagina swells, as its upper end expands and vaginal lubrication increases.
3. In the *orgasmic phase*, or **orgasm**, rhythmic contractions occur along the man's penis, urethra, prostate gland, seminal vesicles, and muscles in the pelvic and anal regions. These involuntary muscular contractions lead to the ejaculation of semen, which consists of sperm

Ask Yourself

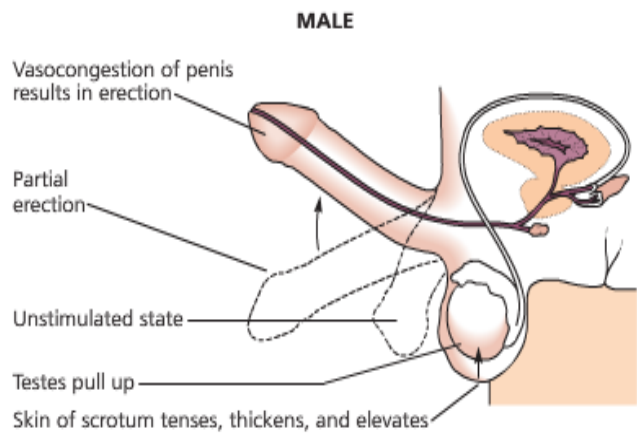
QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think about your own experience as you matured during puberty and adolescence. In what ways did these changes affect your life? How did they contribute to the person you are today?

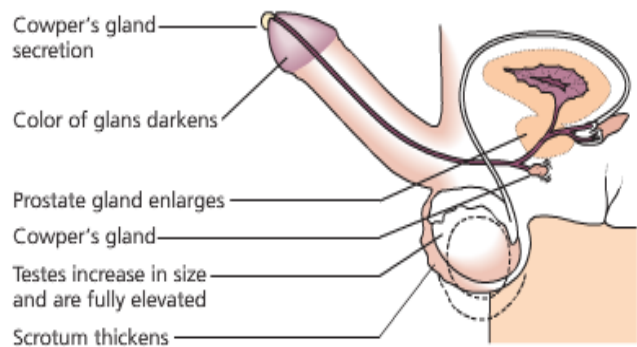
vasocongestion The accumulation of blood in tissues and organs.

orgasm The discharge of accumulated sexual tension with characteristic genital and bodily manifestations and a subjective sensation of intense pleasure.

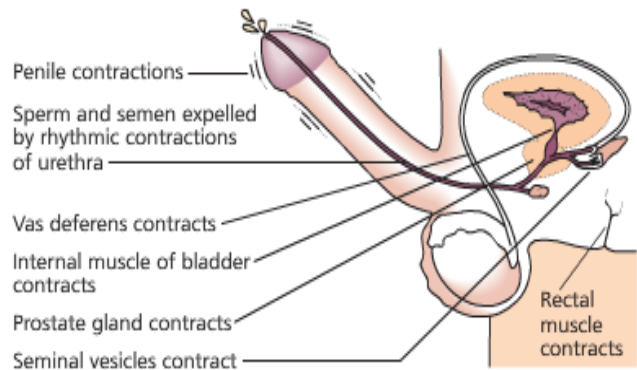
TERMS



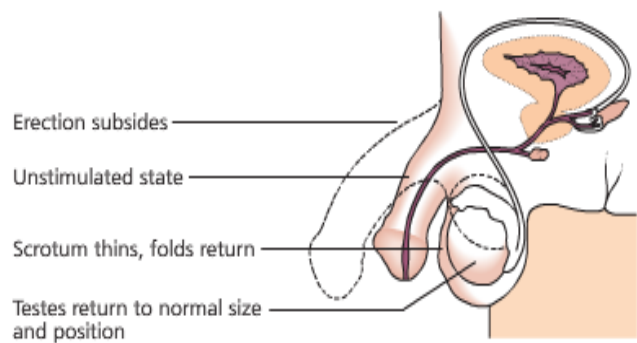
Excitement



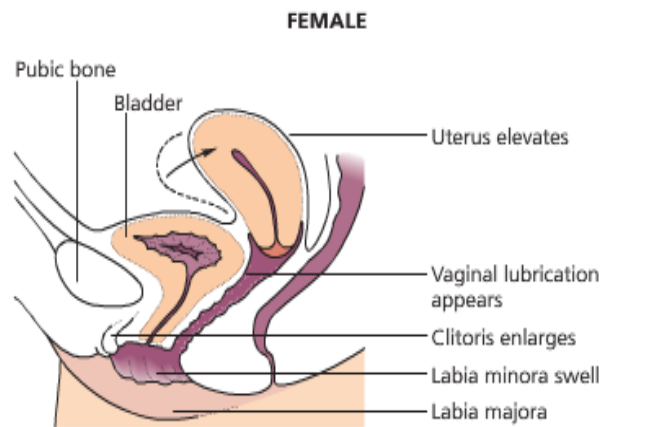
Plateau



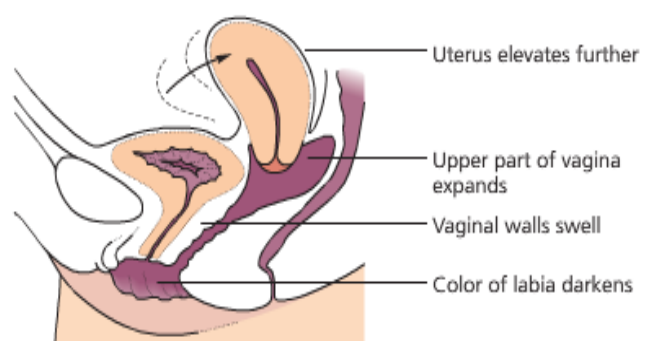
Orgasm



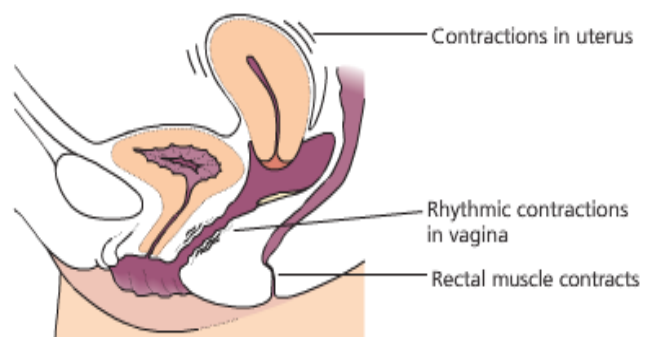
Resolution



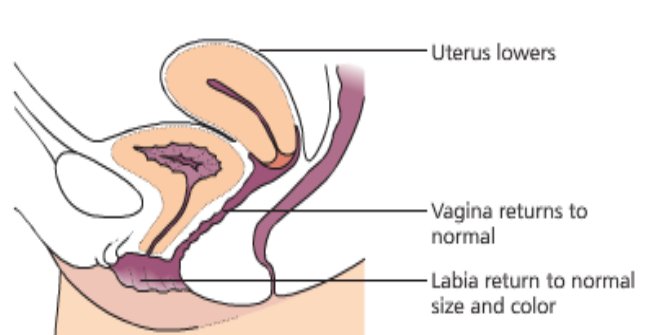
Excitement



Plateau



Orgasm



Resolution

FIGURE 5.7 Stages of the sexual response cycle.

cells from the testes and secretions from the prostate gland and seminal vesicles. In women, contractions occur in the lower part of the vagina and in the uterus, as well as in the pelvic region and the anus.

4. In the *resolution phase*, all the changes initiated during the excitement phase are reversed. Excess blood drains from tissues, the muscles in the region relax, and the genital structures return to their unstimulated state.

More general physical reactions accompany the genital changes in both men and women. Beginning with the excitement phase, nipples become erect, the woman's breasts begin to swell, and in both sexes the skin of the chest becomes flushed; these changes are more marked in women. The heart rate doubles by the plateau phase, and respiration becomes faster. During orgasm, breathing becomes irregular and the person may moan or cry out. A feeling of warmth leads to increased sweating during the resolution phase. Deep relaxation and a sense of well-being pervade the body and the mind.

Male and female reactions during the sexual response cycle differ somewhat. Generally, the male pattern is more uniform, whereas the female pattern is more varied. For instance, the female excitement phase may lead directly to orgasm, or orgasmic and plateau phases may be fused.

Male orgasm is marked by the ejaculation of semen. After ejaculation, men enter a *refractory period*, during which they cannot be restimulated to orgasm. Women do not have a refractory period, and immediate restimulation to orgasm is possible for some women.

Sexual Problems

Both physical and psychological factors can interfere with sexual functioning. Many diseases specifically affect the sex organs. Any illness that affects your general health is likely to have some effect on your ability to function sexually. Disturbances in sexual desire, performance, or satisfaction are referred to as **sexual dysfunctions**. These problems may be due to psychological issues, physical problems, or both.

Common Sexual Health Problems Medical conditions that affect women's sexual organs include the following:

- *Vaginitis* (inflammation of the vagina) is a common problem that can be caused by a variety of organisms: *Candida* (yeast infection), *Trichomonas* (trichomoniasis), and the overgrowth of a variety of bacteria (bacterial vaginosis). Symptoms include vaginal discharge, vaginal irritation, and pain during intercourse. Vaginitis is treated with a variety of topical and oral

medications. (See Chapters 17 and 18 for more information about infection and sexually transmitted diseases.)

- *Endometriosis* is the growth of endometrial-like tissue outside the uterus. It occurs most often in women of childbearing age. Pain in the lower abdomen and pelvis is the most common symptom. Painful premenstrual intercourse may occur. Endometriosis can cause serious problems if left untreated because endometrial tissue can scar and partially or completely block the oviducts, causing infertility (difficulty conceiving) or sterility (the inability to conceive). Endometriosis is treated with medication and/or surgery.

- *Pelvic inflammatory disease (PID)* is an infection of the uterus, oviducts, or ovaries caused when microorganisms spread to these areas from the vagina. Approximately 50–75% of PID cases are caused by sexually transmitted organisms associated with diseases such as gonorrhea and chlamydia. PID can cause scarring of the oviducts, resulting in infertility or sterility. Symptoms include abdominal and pelvic pain, fever, and possibly pain during intercourse. (Chapter 18 discusses sexually transmitted diseases in detail.)

Sexual health problems affecting men include the following:

- *Prostatitis* is an inflammation or infection of the prostate gland. Prostatitis can be acute (sudden) or chronic (gradual and long-lasting). The symptoms of *acute bacterial prostatitis* usually appear suddenly and may include fever, chills, flulike symptoms, pain in the lower back or groin, problems with urination, and painful ejaculation. Acute prostatitis is treated with antibiotics. It is potentially serious, so any man with these symptoms needs to seek immediate medical attention. *Chronic prostatitis* is more common in men over age 40. It can be caused by infection or inflammation of the prostate and is sometimes difficult to diagnose and treat.

- *Testicular cancer* occurs most commonly in men in their twenties and thirties. A rare cancer, it has a very high cure rate if detected early. Every man should perform testicular self-exams regularly (see Chapter 16).

- *Epididymitis* is an inflammation of the epididymis (the coiled tube located on the top and back of each testicle). The most common cause of epididymitis is infection, often sexually transmitted. Symptoms include tenderness over the testicle, swelling, fever, and pain with ejaculation. The treatment is antibiotics.

- *Testicular torsion* occurs when the spermatic cord, which supplies blood to the testicle, becomes twisted. Decreased blood flow to the testicle causes severe, sudden pain, and if not treated quickly, it can cause permanent damage to the testicle. Testicular torsion is most common in adolescents and young men. It can be associated with trauma to the testicle, but can occur spontaneously. Testicular pain should be evaluated by a medical professional promptly; sudden, severe pain is a medical emergency.

QUICK

STATS

Sexually active women under 25 are at greatest risk of PID.

—CDC, 2012

sexual dysfunction A disturbance in sexual desire, performance, or satisfaction.

TERMS

Systemic diseases—illnesses that affect organs throughout the body—affect both men and women, and often affect sexual function. A common example is diabetes (see Chapter 14), which causes a wide variety of problems, including neuropathy (damage to nerves), atherosclerosis (thickening and damage to the walls of the arteries), and poor immune function (making diabetics more prone to infection). Diabetes often results in sexual dysfunction because of poor blood flow to the sexual organs, along with impaired sensation and nerve function. Erectile dysfunction (discussed in the next section) is a common problem in diabetic men. Women with diabetes are especially prone to vaginal yeast infections.

Smoking, alcoholism, and obesity are also major causes of erectile dysfunction in men and sexual problems in women. Sexual difficulties are frequently the first sign of serious health problems because any disease that affects the cardiovascular, nervous, or endocrine system is likely to have an impact on sexual function.

Sexual Dysfunctions The term *sexual dysfunction* encompasses disturbances in sexual desire, performance, or satisfaction. Many physical conditions and drugs can interfere with sexual functioning. Psychological causes and relationship problems can be important factors as well. Sexual satisfaction is highly individual, so no one should feel that it is necessary to live up to a particular standard of sexual performance or “normalcy.” Only you can determine if some aspect of your sexuality is creating a problem for you or your partner.

COMMON SEXUAL DYSFUNCTIONS Three of the most common types of sexual difficulties in men are erectile dysfunction, premature ejaculation, and retarded ejaculation. **Erectile dysfunction** (previously called *impotence*) is the inability to achieve or maintain an erection sufficient for sexual intercourse. Erectile dysfunction occurs in men of all ages, but becomes much more common as men age. **Premature ejaculation** (ejaculation before or just after penetration of the vagina or anus) is also common, especially among younger men. If the problem is persistent and bothersome to the man and his partner, there are numerous treatments. **Retarded ejaculation** is the inability to ejaculate once an erection is achieved. Many men experience occasional difficulty achieving an erection or ejaculating because of excessive alcohol consumption, fatigue, or stress.

Female sexual problems generally involve a lack of desire to have sex, the failure to become physically aroused even when sex is desired, the failure to have an orgasm (**orgasmic dysfunction**), or pain during sexual contact. All of these problems can have physical and psychological components. Many medical problems can influence a woman's desire and ability to respond sexually. Hormonal factors, especially menopause, also have a major influence. Psychological and social issues such as relationship difficulties, family stresses, depression, and past sexual trauma are all frequent causes of sexual dysfunction.

Orgasmic dysfunction has been the subject of a great deal of discussion over the years, as people debated the nature of

the female orgasm and what constitutes dysfunction in women. Many women experience orgasm but not during intercourse, or they experience orgasm during intercourse only if the clitoris is directly stimulated at the same time. In general, the inability to experience orgasm under certain circumstances is a problem only if the woman considers it so.

Dyspareunia (painful intercourse) is a common symptom in women with many possible causes. Infection, lack of lubrication, endometriosis, past sexual trauma, and scarring due to childbirth are a few common reasons for pain during intercourse. In a small percentage of women, **vaginismus** (the involuntary contraction of pubic muscles) makes sexual penetration impossible.

TREATING SEXUAL DYSFUNCTION Most forms of sexual dysfunction are treatable. The first step is to have a physical examination to find a possible medical cause. Heart disease and diabetes, for example, may cause erectile dysfunction; in fact, erectile dysfunction is often the first sign of a serious medical condition. This is one reason why men who buy drugs online to treat their erectile dysfunction without first getting a good medical evaluation may be missing out on the opportunity to diagnose and treat a potentially life-threatening disease (see the box “Sex Enhancement Products”). Up to 80% of all erectile problems are thought to be due to physical factors, particularly vascular problems involving restriction of blood flow. Smoking affects blood flow in the penis (and throughout the body) and is an independent risk factor for erectile dysfunction. Obesity is also a common cause of erectile dysfunction. Being overweight makes a man more vulnerable to cardiovascular problems, and it also can affect his hormonal balance.

Alcohol and many prescription and nonprescription drugs can inhibit sexual response. In particular, antidepressant drugs (especially selective serotonin reuptake inhibitors, such as Prozac) are believed to cause sexual dysfunction in up to 50% of people who take them. Switching to a different antidepressant often helps. Sometimes drugs such as Viagra are used to counteract the side effects of antidepressants.

Other common medications that can inhibit sexual response include certain drugs that treat high blood pressure. Patients are sometimes reluctant to tell their physicians that they are having sexual problems, and may even stop taking their blood pressure medications for this reason. Letting the doctor know about sexual and other side effects is crucial because most of the time the problem can be solved by switching

erectile dysfunction The inability to achieve or maintain an erection sufficient for sexual intercourse.

premature ejaculation Involuntary orgasm before or shortly after the penis enters the vagina or anus; ejaculation that takes place sooner than desired.

retarded ejaculation The inability to ejaculate when one wishes to during intercourse.

orgasmic dysfunction The inability to experience orgasm.

TERMS



CRITICAL CONSUMER

Sex Enhancement Products

The search for substances that can enhance sexual function and pleasure probably began long before recorded history. A huge variety of herbal and animal concoctions reputedly improve sexual function, including ginseng, raw oysters, bear gallbladder, rhinoceros horn, and tiger penis. Although research has shown that none of these products works, people continue to sell them, sometimes at extremely high prices, to gullible buyers. The demand for exotic animal parts has contributed to the endangerment of some of these species.

A number of sex enhancement products have been shown to contain potentially dangerous ingredients. For example, the FDA has cautioned against many dietary supplements sold as “all natural” sexual enhancement products. Some of these supplements contain compounds the same as or very similar to those found in prescription drugs for erectile dysfunction such as Viagra, despite their claims of being herbal or “all natural.” No mention of these Viagra-like compounds is found on these supplements’ labels, though many of them contain full- or even double-strength doses of these drugs.

The FDA is concerned that these falsely labeled products could have dangerous or even lethal side effects, especially when used by people who take drugs that contain nitrates. Nitrates are commonly found in drugs used to treat heart disease and high blood pressure. Nitrates cause blood vessels to dilate, as do prescription drugs used to treat erectile dysfunction. When the two types of drug are used together, blood pressure can plummet, potentially resulting in fainting, falls, heart attacks, or strokes.

People with heart disease who take nitrates are usually instructed not to take Viagra-like medications, so they may be especially tempted to try sexual enhancement products that are marketed as “natural” or “herbal.” Other types of nitrate compounds, such as amyl nitrate, are used as recreational drugs (sometimes called “poppers”) and can be dangerous when combined with Viagra-like drugs.

Another potentially dangerous group of products includes male sex hormones such as testosterone and DHEA (dehydroepiandrosterone). These hormones are potentially dangerous and should never be used without medical supervision. Side effects of male hormones include acne, testicular atrophy, infertility, enlarged breasts, baldness, and accelerated growth of preexisting prostate cancer. Nonprescription hormone products sold on the Internet are of particular concern because there is no guarantee of the actual strength or purity of the ingredients, or even whether the product contains any of the advertised hormone at all.

Another example of a potentially unsafe product sold on the Internet for sexual improvement is Yohimbine, an extract of tree bark. It is marketed as a dietary supplement for low libido, erectile dysfunction, and female sexual problems. These nonprescription forms of Yohimbine are problematic because the FDA does not monitor dietary supplements for strength, purity, quality, effectiveness, or safety. A prescription form of Yohimbine (Yohimbine hydrochloride) is regulated by the FDA. Yohimbine can cause blood pressure changes and rapid and/or irregular heartbeat.

SOURCES: Many herbal sex pills carry hidden heart risk. 2007. *Sacramento Bee*, 13 November, A5; Mayo Clinic. 2011. DHEA (http://www.mayoclinic.com/health/dhea/NS_patient-dhea); Mayo Clinic. 2011. Yohimbine (<http://www.mayoclinic.com/health/drug-information/DR601453>); U.S. National Library of Medicine. 2011. Yohimbe Bark Extract (<http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-yohimbe.html>); Study links erectile dysfunction, heart attack risk. 2010. *Sacramento Bee*, 16 March, A8.

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to a different medication. Newer antihypertensive drugs are highly effective and do not usually have sexual side effects.

Many treatments are available for erectile dysfunction. Viagra (sildenafil citrate), Cialis (tadalafil), and Levitra (vardenafil) work by enhancing the effects of nitric oxide, a chemical that relaxes smooth muscles in the penis. This increases blood flow and allows a natural erection to occur in response to sexual stimulation. The medications are generally safe for healthy men, but they should not be used by men who have a high risk of heart attack or stroke. They are effective in about 70% of users, but there are potential side effects, including headaches, indigestion, facial flushing, back pain, visual and hearing disturbances, and changes in blood pressure.

Viagra use by men between the ages of 18 and 45 has risen dramatically—possibly due to use of the drug for recreational purposes. The drug may cut the refractory period in men who do not have erectile dysfunction; younger men may also be using it to cope with performance anxiety or the effects of other drugs, such as antidepressants.

Although Viagra is not approved by the FDA for use by women, a growing number of women are trying the drug. Research findings are mixed as to whether Viagra can increase sex drive and satisfaction levels in women. Recent studies have shown, however, that the drug can sometimes help women with sexual dysfunction caused by use of antidepressant drugs.

Other treatments for erectile dysfunction in men are available. Prostaglandin E1 (Alprostadil) dilates blood vessels. It can be injected into the penis or placed into the tip of the penis as a tiny suppository about the size of a grain of rice. It works by relaxing the smooth muscles lining the blood vessels in the penis. Alprostadil in a cream form that can be applied to the penis is currently awaiting FDA approval. For a small number of men with testosterone deficiency, hormone replacement therapy is an option. There are also vacuum devices that pull blood into the penis, and in cases where other treatments are unsuccessful, penile implants can be used. Exercise may also help improve erectile

function, especially exercises that target the muscles of the pelvic floor.

Even when there is a physical reason for sexual dysfunction, emotional and social factors frequently compound the problem. Many people with no obvious physical disorder have sexual problems because of psychological and social issues. Too often sexual difficulties are treated with drugs when non-drug strategies may be more appropriate. Psychosocial causes of dysfunction include troubled relationships, a lack of sexual skills, irrational attitudes and beliefs, anxiety, and psychosexual trauma such as sexual abuse or rape. Many of these problems can be addressed by sex therapy. A therapist may recommend books or films to help counter sexual myths and teach sexual skills. A therapist can also promote open discussion between partners and suggest specific techniques.

Premature ejaculation is an example of a common sexual problem that often responds well to nondrug therapy. On average, men typically ejaculate between 2 and 10 minutes after intercourse begins, but most men periodically ejaculate more quickly. There are several nondrug techniques that are frequently helpful for men who habitually ejaculate sooner than they would like. Kegel exercises, which strengthen and improve control of the pelvic muscles, are often helpful, as are other techniques that, with practice, increase control of ejaculation. Certain antidepressants delay ejaculation and are sometimes prescribed for this purpose.

Women who seek treatment for orgasmic dysfunction often have not learned what types of stimulation will excite them and bring them to orgasm. Most sex therapists treat this problem with **masturbation** (genital self-stimulation). Women are taught about their own anatomy and sexual responses and then are encouraged to experiment with masturbation until they experience orgasm. Once they can masturbate to orgasm, they can transfer this learning to sexual intercourse with a partner.

Substances being tested for the treatment of female sexual dysfunction include prostaglandin creams and testosterone patches. A prostaglandin cream that improves blood flow to the clitoris is currently being developed and may be available to treat female sexual arousal disorder in the future. Another

Any disease affecting the cardiovascular, nervous, or endocrine systems may also affect sexual function.

option is a device that creates suction over the clitoris to increase blood flow and sensitivity.

Dyspareunia and vaginismus are treated first by diagnosing and treating any underlying physical cause of the problem. The use of generous amounts of lubricant during sexual activity is important. Sexual therapy for vaginismus often involves gradual desensitization techniques. Recently Botox (a chemical that paralyzes muscles) injections have been used successfully in relaxing the pubic muscles in some women with vaginismus.

SEXUAL BEHAVIOR

Many behaviors stem from sexual impulses, and sexual expression takes a variety of forms. Probably the most basic aspect of sexuality is reproduction. But sexual excitement and satisfaction are aspects of sexual behavior separate from reproduction. The intensely pleasurable sensations of arousal and orgasm are probably the strongest motivators for human sexual behavior. People are infinitely varied in the ways they seek to experience erotic pleasure.

The Development of Sexual Behavior

Sexual behavior is a product of many factors, including genetics, physiology, psychology, and social and cultural influences. Our behavior is shaped by the interplay of our biological predispositions and our life experiences.

Gender Roles and Gender Identity As mentioned in Chapters 2 and 4, your *gender role* is everything you do in your daily life that expresses your maleness or femaleness to others, including dress, speech patterns, and mannerisms. Your **gender identity** is your personal, inner sense of being male or female.

Biological sex, gender role, and gender identity are usually in agreement. The term **cisgender** is used to describe people whose biological sex matches their gender identity.

Some people experience conflict among their sex, gender role, and gender identity. A man who feels trapped in a man's body and wants to be a woman may look male, but his gender identity is female. The umbrella term **transgender** is often

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What do you think about using medication to treat different types of sexual dysfunction? What alternatives do you think should be considered before trying medication? Do you think the general public is appropriately educated about the side effects of such products? In your opinion, would the potential benefits outweigh the risks?

masturbation Self-stimulation for the purpose of sexual arousal and orgasm.

gender identity A person's personal, internal sense of maleness or femaleness.

cisgender Term describing an individual whose biological sex and gender identity are the same.

transgender Term describing an individual whose appearance, personal characteristics, or behavior differs from social and cultural norms for males and females.

TERMS



Our sense of gender identity and many of our gender-role behaviors are overwhelmingly influenced by cultural factors. This young girl is learning gender-appropriate behaviors by imitating her mother.

used to describe anyone whose appearance, personal characteristics, or behavior differs from the social and cultural norms for males and females. Transgender individuals may be heterosexual, homosexual, bisexual, or asexual, or they may have any combination of sexual orientations. Transgender individuals include the following:

- **Transsexual** men and women, who feel their biological sex does not match their gender identity. Transsexuals may seek sex reassignment, which involves hormonal treatments to induce secondary sex characteristics such as breasts or facial hair, and/or surgery to change the appearance of the genitals or breasts. Biological men who want to be treated and viewed as women are called male-to-female transsexuals. Biological females who want to be viewed and treated as men are called female-to-male transsexuals. Not all transsexuals desire surgical or hormonal treatment.

- **Transvestites**, who enjoy wearing clothing identified with the other gender. Cross-dressing covers a broad range of behaviors, from wearing one article of clothing of the other sex in a private location to wearing an entire outfit in public.

- **Transgender** children, who may, from an early age, show intense and persistent distress about their biological sex and may behave and view themselves as the other sex. Some of these children may be diagnosed with gender identity disorder.

- Men or women, regardless of sexual orientation, whose appearance, characteristics, or behavior is perceived as gender-atypical in their society or culture.

- **Intersexed** individuals who were born with ambiguous genitals due to genetic or hormonal abnormalities. Intersexed people may or may not have undergone surgery as infants to assign them to a particular sex. Most people who consider themselves transgender are born with typical male or female anatomy; intersexed people are born with atypical genitalia.

BIOLOGICAL AND CULTURAL INFLUENCES Some gender characteristics are determined biologically, such as the genitals a person is born with and the secondary sex characteristics that develop at puberty. Others are defined by society and learned in the course of growing up. From birth, children are encouraged to behave in ways their culture deems appropriate for one sex or the other. In our society, parents usually give children gender-specific names, clothes, and toys, and children may model their own behavior after their same-sex parent. Family and friends create an environment that teaches the child how to act appropriately as a girl or a boy. Teachers, television, books, and even strangers model these gender roles.

Gender roles vary from one society to another and from one time to another. In the United States today, for example, many women shave their legs and wear makeup; in some Muslim cultures, women wear robes and veils that conceal their face and body. Each set of behaviors expresses some learned aspect of the female gender role in that society, and each set would be inappropriate in the other society. Standards of sexual attractiveness also vary from one culture to another.

Gender-Role Flexibility Historically gender roles have tended to emphasize the differences between males and females, but new gender roles are emerging in our society that reflect a mix of male and female characteristics and behaviors. This tendency toward **androgyny** greatly broadens the range of experiences available to both males and females. Androgynous adults are less gender-stereotyped in their thinking; in how they look, dress, and act; in how they divide work in the home; in how they think about jobs and careers; and in how they express themselves sexually.

TERMS

Intersex A condition in which a person is born with reproductive anatomy that is neither typically male nor typically female.

androgyny The state of being neither overtly male nor overtly female.



The mass media often portray young Americans as sexual athletes, who frequently engage in casual sex with many partners. Such characters are seldom shown discussing safer sex practices.

Gender, Sexuality, and the Mass Media

Many of our ideas about sexuality and gender roles are shaped by the mass media. Media images of sexuality can be as influential as the family in shaping the sexual attitudes and behaviors of individuals. Yet these images are often unrealistic and help perpetuate sexual stereotypes in our society. The mass media rarely portray people negotiating safer sex or communicating seriously about other sexual issues.

Childhood Sexual Behavior The capacity to respond sexually is present at birth. Ultrasound studies suggest that boys experience erections in the uterus. After birth, both sexes have the capacity for orgasm, though many babies may not experience it. As children grow, many discover this capacity through self-exploration. Sexual behaviors gradually emerge in childhood; self-exploration and touching the genitals are common forms of play, observed among infants as young as six months. They gradually lead to more deliberate forms of masturbation, with or without orgasm.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How did your romantic and sexual relationships during adolescence (or lack thereof) influence how you felt about yourself? What influenced your beliefs about what sex would be like? Were your first sexual experiences satisfying? Were they what you expected? What misconceptions did you have about sex during adolescence? When and how were they corrected?

Children often engage in sexual play with playmates by exploring each other's genitals. These activities are often part of games like "playing house" or "playing doctor." By age 12, 40% of boys have engaged in sex play. The peak exploration age for girls is 9, by which time 14% have had such experiences.

Adolescent Sexuality A person who has experienced puberty is biologically becoming an adult. But in psychological and social terms, people take 5–10 more years to attain full adult status. This discrepancy between biological and social maturity creates considerable confusion over what constitutes appropriate sexual behavior during adolescence. Most countries have laws regarding the age at which someone is deemed old enough to make the decision to have sexual intercourse (the "age of consent"). Sex below that age is illegal, even if the young person agrees willingly. In the United States, the age of consent varies between age 16 and 18 depending on the state.

Sexual fantasies and dreams become more common and explicit in adolescence than at earlier ages, often as an accompaniment to masturbation. Research has shown that about 80% of teenage boys and 55% of teenage girls masturbate more or less regularly. Once puberty is reached, orgasm in boys is accompanied by ejaculation. Teenage boys also experience **nocturnal emissions** ("wet dreams"). Some girls also have orgasmic dreams.

Sexual interaction during adolescence usually takes place between peers in the context of dating or partying. Sexual intimacy is usually expressed in such relationships through kissing, caressing, and stimulating the breasts and genitals. These activities lead to arousal but may not culminate in orgasm.

Many American teenagers also engage in sexual intercourse. Almost half (46%) of 15- to 19-year-olds in the United States have had sex at least once. Rates for premarital sex vary considerably from one group to another, based on ethnic, educational,

QUICK

STATS

The average age of first sexual intercourse in the United States is about **17 years old.**

—The Kinsey Institute, 2010

nocturnal emission Orgasm and ejaculation (wet dream) during sleep.

TERMS



WELLNESS ON CAMPUS

Questions to Ask before Getting Involved in a Sexual Relationship

Whom am I sexually attracted to?

- What are the characteristics that usually attract me to someone in a physical way?
- How comfortable am I with the people I find sexually attractive? What would I change if I could?
- Are the people I am usually sexually attracted to the same types of people that I could envision having a long-term, stable relationship with? Why or why not?

What sexual behaviors are comfortable for me right now?

- What has influenced my comfort level with these behaviors?
- What am I not entirely comfortable with, but would be willing to experiment with in order to please a partner? What level of trust would I need to establish with that partner in order to proceed? What would we need to talk about ahead of time?
- What exactly do I say in order to make my comfort level clear to my partner? What do I do if my partner tries to push me beyond my comfort level?

How can I express my sexual needs, desires, and concerns to a potential sexual partner?

- When would be the best time to talk about these needs, desires, and concerns?

- How do I start the conversation?
- What will I do if my needs are not being met and/or my concerns are not taken seriously?

What preparations do I need to make in order to engage in the safest sex possible?

- If I am engaging in heterosexual sexual activity, I need to obtain birth control. Have I consulted a health professional to figure out the best method of birth control for myself and my partner? Do I know how to employ this method correctly? Have we discussed what we plan to do if a pregnancy occurs?
- If I am engaging in any type of sexual activity with a partner, I need protection from STDs. Have I consulted a health professional to figure out the best method of STD protection for myself and my partner? Do I know how to employ this method correctly? Have I discussed with my partner his or her sexual history, including information about risky behavior and STDs?
- What do I need from my partner in order to ensure that I feel emotionally safe before, during, and after our sexual behavior together?
- Do I engage in any behaviors that cause me to participate in sexual activity that I wouldn't otherwise be comfortable with, such as excessive drinking or drug use? What do I need to do in order to reduce or eliminate these behaviors?



socioeconomic, religious, geographic, and many other factors. First-time intercourse is affected by these same factors, plus psychological readiness, fear of consequences, being in love, going steady, peer pressure, and the desire to act like an adult, gain popularity, or rebel. Family relationships and attitudes toward sex impact teen sexual behavior. Additionally, a teen's perception of what is "normal" among peers has a strong influence on his or her choices about sex.

Beginning in childhood, sex play involves members of one's own sex as well as of the other sex. Same-sex attractions, with or without sexual encounters, are common in adolescence, and are not always necessarily related to adult sexual orientation. Many adult homosexual men and women, however, recall same-sex attractions in childhood.

Adult Sexuality Early adulthood is a time when people make important life choices—a time of increasing responsibility in terms of interpersonal relationships and family life. In recent years there has been a trend toward marriage at a later age than in past decades. Before marriage, more young adults are driven by a need to become sexually knowledgeable. Today more people in their twenties believe that becoming sexually experienced rather than preserving virginity is an important prelude to selecting a mate. (See the box "Questions to Ask before Getting Involved in a Sexual Relationship.")

Individual motivations for engaging in sexual activities change with age. Younger men state that they engage in sex for physical reasons, whereas women of the same age state that they engage in sex for emotional reasons. As men and women get older, their motives change; men more often engage in sex for emotional reasons, and women more often for physical reasons. In the oldest age groups, women's and men's motives for sex are actually the reverse of those of the earliest age groups. In addition to age, many factors such as ethnicity, educational attainment, and living arrangements also influence adult choices about sexuality.

Sexuality in Illness and Disability Any disease or disability that affects mobility, well-being, self-esteem, or body image has the potential to affect sexual expression. People with chronic diseases or disabilities often have special needs regarding their sexual behavior. They may also confront the perception that they are asexual. Sexuality is integral to all of us, regardless of our physical status.

Sexual Orientation

Sexual orientation is a consistent pattern of emotional, romantic, and sexual attraction to men, women, or both sexes. It exists along a continuum that ranges from exclusive heterosexuality



This couple's physical experiences together will be powerfully affected by their emotions, ideas, values, and the quality of their relationship.

(attraction to people of the other sex) through bisexuality (attraction to people of both sexes) to exclusive homosexuality (attraction to people of one's own sex). The terms *straight* and *gay* are often used to refer to heterosexuals and homosexuals, respectively, and female homosexuals are also referred to as *lesbians*. In recent years, the term *queer* has been reclaimed as a self-identifier by some elements of the gay community. Sexual orientation involves feelings and self-concept, and individuals may or may not express their sexual orientation in their behavior. In national surveys, about 2–6% of men identify themselves as homosexuals and about 2% of women identify themselves as lesbians. It is difficult to gauge the accuracy of these estimates because people may not tell the truth in surveys that probe very sensitive and private aspects of their lives. In addition, people's expressed sexual identities may be quite different from their actual sexual practices. For example, some people identify as heterosexual, but most of their sexual partners may be of their own sex.

Heterosexuality The great majority of people are heterosexual. Heterosexual relationships usually include all of the behavior and relationship patterns described in Chapter 4: dating, engagement, living together, and marriage.

Homosexuality Homosexuality exists in all cultures. Attitudes toward homosexuality vary tremendously in different civilizations. In some cultures, homosexual behavior is fully accepted. In others, homosexuality may be tolerated but not encouraged, and in some societies homosexuality is illegal and can be punished severely, even by death. Homosexual individuals are as varied and different from one another as are heterosexuals. Just like heterosexuals, lesbians and gay men may be in long-term, committed relationships, or they may date different people.

Bisexuality Many experts believe that human sexuality exists on a spectrum with a few individuals who are completely heterosexual on one end and those who are attracted exclusively to members of their own sex on the other. From this point of view, most of us are potentially bisexual, but only a relatively small number of people are more or less equally attracted to both men and women. In the United States, fewer than 5% of men and women identify themselves as bisexual. Some bisexuals are involved with partners of both sexes at the same time, whereas others may alternate between same-sex partners and partners of the other sex ("serial bisexuality").

The Origins of Sexual Orientation Many theories try to account for the development of sexual orientation. At this time, most experts agree that sexual orientation results from multiple genetic, hormonal, cultural, social, and psychological factors. Most people report being aware of their gender identity and sexual orientation early in life, long before they actually became sexually active. Most people do not feel that they had a choice in their sexual orientation. The majority of experts agree that conscious choice is not usually a factor in whether someone is gay or straight.

Scientists are now looking for genetic markers associated with sexual orientation in males. Twin studies are another way of looking at the genetic contribution to sexual identity. Identical twins share the same DNA, so if sexual orientation were entirely genetically determined, we would expect that if one identical twin were homosexual, the other would be as well. But studies of many identical twins (both gay and lesbian) show that the odds are between 30% and 50% that both twins will have the same sexual orientation. These studies provide evidence that our genes make an important but limited contribution to our sexual orientation.

Exposure to hormones before birth also has a major impact on sexual orientation. Experiments with mice show that exposure to sex hormones early in development determines whether they will ultimately be sexually attracted to male or female mice. The situation is much more complicated in humans, but most researchers believe that the hormonal environment in the womb has an important influence on sexual orientation. A 2010 report from the Netherlands Institute for Neuroscience explains how the fetal development of the genitalia and the development of the brain in a male or female direction occur at different times, sometimes resulting in transsexual individuals who have genitalia of one sex, but

identify with and “think like” the other sex. According to these researchers, a person’s environment has no impact on his or her gender identity or sexual orientation.

Researchers have also compared the brain structure of homosexual and heterosexual men. Although numerous differences have been found, they are not consistent across all studies. Also, even if brain structure differences exist, it is unclear whether they are the cause or an effect of differences in sexual orientation.

Several studies have shown that the more older brothers a boy has, the more likely he will be to grow up to be gay. The odds of being gay go up 33% with each older brother. There are numerous theories to explain this phenomenon. One intriguing, but unproven, theory suggests that mothers with multiple biological sons may develop antibodies against proteins produced by male fetuses. The immune response by the mother may affect the fetal development of later sons, resulting in an increased chance of homosexuality.

Many psychological theories have also been proposed. Researchers have looked at how much contact children have with members of the two sexes, at the types of relationships children have with their parents, and at family dynamics. Early negative experiences with heterosexuality or positive experiences with homosexuality have also been proposed as possible influences. The significant growth of single-parent families over the past 40 years has not been accompanied by large shifts in sexual orientation among Americans, so it is unlikely that family dynamics or early learning experiences are strong factors in determining sexual orientation. In addition, parents’ sexual orientation seems to have little impact on children’s sexual orientation. Studies of children raised by gay or lesbian parents show that these children’s ultimate sexual orientation is similar to that of children raised by heterosexual parents.

So far, most studies on the origin of sexual orientation have focused on males. The factors that determine sexual orientation in women may be even more complex. Perhaps the most important message is that sexual orientation is most likely the result of the complex interaction of biological, psychological, and social factors, possibly different in the case of each individual.

Varieties of Human Sexual Behavior

Some sexual behaviors are aimed at self-stimulation only, whereas other practices involve interaction with a partner. Some people choose not to express their sexuality at all.

Celibacy Continuous abstention from sexual activities, termed **celibacy**, can be a conscious and deliberate choice, or it can be necessitated by circumstances. Health considerations and religious and moral beliefs may lead some people to celibacy, particularly until marriage or until an acceptable partner appears.

Many people use the related term *abstinence* to refer to avoidance of just one sexual activity—intercourse. The use of abstinence to prevent pregnancy and sexually transmitted diseases is discussed in Chapters 6 and 18.

Autoeroticism and Masturbation The most common form of **autoeroticism** is **erotic fantasy**—creating imaginary experiences that range from fleeting thoughts to elaborate scenarios.

Masturbation involves manually stimulating the genitals, rubbing them against objects, or using stimulating devices such as vibrators. Although commonly associated with adolescence, masturbation is practiced by many throughout adult life. It may be used as a substitute for sexual intercourse or as part of sexual activity with a partner. Masturbation gives a person control over the pace, time, and method of sexual release and pleasure.

Touching and Foreplay Touching is integral to sexual experiences, whether in the form of massage, kissing, fondling, or holding. Our entire body surface is a sensory organ, and touching almost anywhere can enhance

intimacy and sexual arousal. Touching can convey a variety of messages, including affection, comfort, and a desire for further sexual contact.

During arousal, many men and women manually and orally stimulate each other by touching, stroking, and caressing their partner’s genitals. Men and women vary greatly in their preferences for the type, pacing, and vigor of such **foreplay**. Working out the details to accommodate each other’s pleasure is a key to enjoying these activities. Direct communication about preferences can enhance sexual pleasure and protect both partners from physical and psychological discomfort.

Oral-Genital Stimulation **Cunnilingus** (the stimulation of the female genitals with the lips and tongue) and **fellatio** (the stimulation of the penis with the mouth) are common practices. Oral sex may be practiced either as part of foreplay or as a sex act culminating in orgasm. Although prevalence varies in different populations, 90% of men, 88% of women, and more than 50% of teens report that they have engaged in oral sex. A recent study showed that more teens

QUICK STATS

Among college-age Americans, **62% of men and 35% of women report masturbating at least once in the past 30 days.**

—The Kinsey Institute, 2010

TERMS

celibacy Continuous abstention from sexual activity.

autoeroticism Behavior aimed at sexual self-stimulation.

erotic fantasy Sexually arousing thoughts and daydreams.

foreplay Kissing, touching, and any form of oral or genital contact that stimulates people toward intercourse.

cunnilingus Oral stimulation of the female genitals.

fellatio Oral stimulation of the penis.

aged 15–19 had engaged in oral sex than had engaged in vaginal intercourse. The most common reasons given for postponing vaginal sex were avoidance of pregnancy, the desire to remain technically a virgin, and the avoidance of sexually transmitted diseases (STDs). Many people have the incorrect belief that they cannot acquire an STD during oral sex. Numerous STDs, including HIV, herpes, HPV, gonorrhea, chlamydia, and syphilis, can all be transmitted through oral sex (see Chapter 18).

Like all acts of sexual expression between two people, oral sex requires the cooperation and consent of both partners. If they disagree about its acceptability, they need to discuss their feelings and try to reach a mutually pleasing solution.

Anal Intercourse About 10% of heterosexuals and 50% of homosexual males regularly practice anal stimulation and penetration by the penis or a finger. The receiver does not usually reach orgasm from anal intercourse, though men usually experience orgasm while penetrating.

Because the anus is composed of delicate tissues that tear easily under such pressure, anal intercourse is one of the riskiest of sexual behaviors for the transmission of HIV and all other sexually transmitted infections. Anal intercourse is also associated with increased risk of anal cancer, hemorrhoids, anal fissures, prolapsed rectum, and fecal incontinence. The use of condoms is highly recommended for anyone engaging in anal sex. Special care and precaution should be exercised if anal sex is practiced—cleanliness, lubrication, and gentle entry at the very least. Anything that is inserted into the anus should not subsequently be put into the vagina unless it has been thoroughly washed. Bacteria normally present in the anus can cause vaginal infections, as well as urinary tract infections.

Sexual Intercourse For most adults, most of the time, **sexual intercourse** (*coitus*) is the ultimate sexual experience. Men and women engage in vaginal intercourse to fulfill sexual and psychological needs, as well as to reproduce. In a 2006 study by the National Center for Health Statistics, 87% of men aged 15–44 and 98% of women in the same age group reported having had vaginal intercourse. The most common heterosexual practice is the man inserting his erect penis into the woman's dilated and lubricated vagina after sufficient arousal.

Much has been written on how to enhance pleasure through various coital techniques, positions, and practices. For a woman, the key factor in physical readiness for coitus is adequate vaginal lubrication, and in psychological readiness, being aroused and receptive. For a man, the setting and the partner must arouse him to attain and maintain an erection. Psychological factors and the quality of the relationship are more important to overall sexual satisfaction than sophisticated or exotic sexual techniques.

One of the commonly stated reasons for having sex is to express emotional attachment to one's partner.

Why People Have Sex People have sex for a multitude of reasons. Common reasons among men and women include the obvious, such as “for pleasure,” “for fun,” and “to have a baby,” but often reasons are more complicated and surprising. According to a 2007 survey of men and women, reasons for having sex included such things as revenge, to cure a headache, to impress friends, and to get closer to God. Among women, “chemical” attraction, including a potential partner's smell, was found to be a major factor in the choice of a sexual partner, along with personality and social standing. Men tend to be more visual in their attraction to a potential sexual partner. Among both men and women, one of the most popular reasons to have sex was to express emotional attachment to their partner.

Atypical and Problematic Sexual Behaviors

In American culture, many kinds of sexual behavior are accepted. However, some types of sexual expression are considered harmful; they may be illegal, classified as mental disorders, or both. Because sexual behavior occurs on a continuum, it is sometimes difficult to differentiate a behavior that is simply atypical from one that is harmful. When attempting to evaluate an unusual sexual behavior, experts consider the issues of consent between partners and whether physical or psychological harm is done to the individual or to others.

The term *paraphilia* is used to describe certain sexual behaviors that are atypical and cause harm to self or others. Clinically, the term may be used for a behavior that causes significant distress to the individual involved or to other people. Paraphilias of clinical concern are characterized by recurring, intense sexual fantasies and urges that involve nonhuman objects, the suffering or humiliation of oneself or one's partner, or children or other nonconsenting individuals. Examples are peeping into strangers' homes, making obscene phone calls, and having sexual contact with children. The effects of paraphilic behavior on others range from minor upset to serious physical and long-term psychological harm. The American Psychiatric Association considers paraphilias to be mental disorders.

The use of force and coercion in sexual relationships is one of the most serious problems in human interactions. The most extreme manifestation of **sexual coercion**—forcing a

sexual intercourse Sexual relations involving genital union; also called coitus, and also known as making love.

sexual coercion The use of physical or psychological force or intimidation to make a person submit to sexual demands.

TERMS

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What do you consider to be appropriate, moral sexual behavior? What behaviors do you think are inappropriate or immoral? What experiences have shaped your views of such behaviors?

person to submit to another's sexual desires—is rape, but sexual coercion occurs in many subtler forms, such as sexual harassment. Sexual coercion—including rape, the sexual abuse of children, and sexual harassment—is discussed in detail in Chapter 21.

Commercial Sex

Conflicting feelings about sexuality are apparent in the attitudes of Americans toward commercial sex: prostitution and sexually oriented materials in a variety of formats. Our society supposedly disapproves of prostitution, but it also provides prostitutes with their customers. Pornography is readily available and widely viewed in our society, although many people are concerned about its ubiquitous nature and the blurring of pornography with popular culture.

Pornography Derived from the Greek word meaning “the writing of prostitutes,” **pornography** (*porn*) is now often defined as obscene literature, art, or movies. A major problem in identifying pornographic material is that different people and communities have different opinions about what is obscene. Differing definitions of obscenity have led to many legal battles over potentially pornographic materials. Currently the sale and rental of pornographic materials is restricted so that only adults can legally obtain them; materials depicting children in sexual contexts are illegal in any format or setting.

Many people distinguish between “soft porn” and “hard porn” materials. Soft porn, often marketed for couples, typically includes an apparently loving couple having sex in a relaxed setting. There is mutual kissing and touching, and both partners are shown as having a positive experience. In hard porn, there is usually little mutual touching, and only the male appears to enjoy the experience. Hard porn sometimes explicitly depicts sexual violence and exploitation. Hard porn materials tend to be the focus of more criticism than soft porn materials.

Much of the debate about pornography focuses on whether it is harmful. Some people argue that adults who want to view pornographic materials in the privacy of their own homes should be allowed to do so. Others feel that the



By law, pornographic materials can be purchased only by adults. Many retail establishments refuse to sell porn, while some businesses keep their stocks of porn hidden from public view. A few businesses are devoted to selling pornography and other adult-oriented materials.

exposure to explicit sexual material can lead to delinquent or criminal behavior, such as rape or the sexual abuse of children. Currently there is no reliable evidence that pornography by itself leads to violence or paraphilic behavior, and debate is likely to continue.

Online Porn and Cybersex The appearance of thousands of sexually oriented websites has expanded the number of people with access to pornography, and has made it more difficult for authorities to enforce laws regarding porn. People who might have hesitated to buy magazines or rent videos in person can now access sexually explicit materials online. Of special concern is the increased availability of child pornography, which previously could be acquired only with great difficulty and at great legal risk. Online porn is now a multibillion-dollar industry.

In addition to (or instead of) viewing porn online, hundreds of thousands of people also use the Internet to engage in **cybersex**, or *virtual sex*. Cybersex is erotic interaction between people who are communicating over the Internet. People can engage in cybersex in many different ways, such as visiting sexually oriented websites, joining cybersex chat rooms, participating in videoconferences via web cams, or even exchanging e-mail messages. Participants may have sexually explicit discussions, share private photographs, or engage in fantasy role playing online. Many cybersex participants report feeling some degree

QUICK STATS

40 million
Americans regularly
visit pornographic
websites.

—GIZMODO, 2010

pornography The explicit or obscene depiction of sexual activities in pictures, writing, or other material.

TERMS

cybersex Erotic interaction between people who are not in physical contact, conducted over a network such as the Internet; also called virtual sex.

of sexual excitement; some masturbate while viewing erotic images online or engaging in sexual chat.

Although many people view cybersex as a safe form of sexual expression, it is not without problems. It can be addictive, and some cybersex addicts report spending more than 50 hours a week online for sexual purposes. People who become addicted to cybersex or viewing online porn may become isolated and perform poorly at work or school. Their addiction may also have a negative impact on their interpersonal relationships.

“Sexting,” sending provocative photos from cell phone to cell phone, has become popular, sometimes with serious consequences. Images can end up traveling from person to person by cell phone and from there onto social networking websites like Facebook. These images can haunt individuals years later when they are viewed by potential employers or partners. Some teens have found themselves charged with child pornography and have even faced jail time as a result of forwarding a sexually explicit photo of an underaged person to a friend.

Prostitution The exchange of sexual services for money is **prostitution**. Prostitutes may be men, women, or children, and the buyer of a prostitute’s services is nearly always a man. Except in parts of Nevada, prostitution is illegal in the United States.

Sex with a prostitute provides the customer with sexual release without commitment, the expectation of intimacy, or fear of rejection. Some men patronize prostitutes to have sex with a different type of partner than usual or to engage in a type of sex their usual partner will not permit. Most customers are white, middle-class, middle-aged, and married. Although they come from a wide variety of backgrounds, prostitutes are usually motivated to join the profession because of money.

AIDS and other STDs are major concerns for prostitutes and their customers. Many prostitutes are injection drug users or are involved with men who are. The rate of HIV infection among prostitutes varies widely, but in some parts of the country it is as high as 25–50%. Unfortunately many prostitutes are children. The majority of prostitutes, both female and male, began working as prostitutes before they were 16 years of age. A majority of prostitutes report that they were sexually abused as children. Many prostitutes start out as child runaways, escaping abusive homes and turning to prostitution as a way to survive.

Responsible Sexual Behavior

Healthy sexuality is an important part of adult life. It can be a source of pleasurable experiences and emotions and an

important part of intimate partnerships. But sexual behavior also carries many responsibilities, as well as potential consequences such as pregnancy, STDs, and emotional changes in the relationship. Every sexually active person should be aware of these consequences and accept responsibility for them.

Open, Honest Communication Each partner needs to clearly indicate what sexual involvement means to him or her. Does it mean love, fun, a permanent commitment, or something else? The intentions of both partners should be clear. For strategies on talking about sexual issues with your partner, see the box “Communicating about Sexuality.”

Agreed-On Sexual Activities No one should pressure or coerce a partner. Sexual behaviors should be consistent with the sexual values, preferences, and comfort level of both partners. Everyone has the right to refuse sexual activity at any time.

Sexual Privacy Intimate relationships involving sexual activity are based on trust, and that trust can be violated if partners reveal private information about the relationship to others. Sexual privacy also involves respecting other people—not engaging in activities in the presence of others that would make them uncomfortable. The question of how to handle bringing a partner back to a shared dorm room is something that many college students must address. Roommates should be respectful of one another and discuss the situation in advance to avoid embarrassing encounters.

Using Contraception If pregnancy is not desired, contraception should be used during sexual intercourse. Both partners need to take responsibility for protecting against unwanted pregnancy. Partners should discuss contraception before sexual involvement begins. (See Chapter 6 for more information about contraception.)

Safe Sex Both partners should be aware of and practice safe sex to guard against STDs. Many sexual behaviors carry the risk of STDs, including HIV infection. Partners should be honest about their health and any medical conditions and work out a plan for protection. (For more information on STDs and safe sex practices, see Chapter 18.)

Sober Sex The use of alcohol or drugs in sexual situations increases the risk of unplanned, unprotected sexual activity. This is particularly true for young adults, many of whom binge-drink during social events. The link between intoxication and unsafe sex is illustrated by a recent study that found that states with higher drinking ages and higher beer taxes have lower rates of STDs. Alcohol and drugs impair judgment and should not be used in association with sexual activity. Be honest with yourself; if you need to drink in order to

prostitution The exchange of sexual services for money.

TERMS



TAKE CHARGE

Communicating about Sexuality

To talk with your partner about sexuality, follow the general suggestions for effective communication in Chapter 4. Getting started may be the most difficult part. Some people feel more comfortable if they begin by talking about talking—that is, initiating a discussion about why people are so uncom-

fortable talking about sexuality. Talking about sexual histories—how partners first learned about sex or how family and cultural background influenced sexual values and attitudes—is another way to get started. Reading about sex can also be a good beginning: partners can read an article or book and then discuss their reactions.

Be honest about what you feel and what you want from your partner. Cultural and personal obstacles to discussing sexual subjects can be difficult to overcome, but self-disclosure is important for successful relationships. Research indicates that when one partner openly discusses attitudes and feelings, the other partner is more likely to do the same. If your partner seems hesitant to open up, try asking open-ended or either/or questions: “Where do you like to be touched?” or “Would you like to talk about this now or wait until later?”

If something is bothering you about your sexual relationship, choose a good time to initiate a discussion with your partner. Be

specific and direct but also tactful. Focus on what you actually observe rather than on what you think the behavior means. “You didn’t touch or hug me when your friends were around” is an observation. “You’re ashamed of me around your friends” is an inference about your partner’s feelings. Try focusing on a specific behavior that concerns you rather than on the person as a whole—your partner can change behaviors but not his or her entire personality. For example, you could say “I’d like you to take a few minutes away from studying to kiss me” instead of “You’re so caught up in your work, you never have time for me.”

If you are going to make a statement that your partner may interpret as criticism, try mixing it with something positive: “I love being with you, but I feel annoyed when you. . . .” Similarly, if your partner says something that upsets you, don’t lash back. An aggressive response may make you feel better in the short run, but it will not help the communication process or the quality of the relationship.

If you want to say no to some sexual activity, say no unequivocally. Don’t send mixed messages. If you are afraid of hurting your partner’s feelings, offer an alternative if it’s appropriate: “I am uncomfortable with that. How about . . . ?”

If you’re in love, you may think that the sexual aspects of a relationship will work out magically without discussion. However, partners who never talk about sex deny themselves the opportunity to increase their closeness and improve their relationship.

connect
ACTIVITY
DO IT ONLINE

engage in sexual activities, maybe it’s time to rethink your social life and relationships.

Aside from the dangers of mixing alcohol and sex, alcohol impairs sexual performance in both men and women. Although alcohol may lower sexual inhibition and make people more likely to attempt a sexual encounter, too much alcohol makes it difficult for a man to achieve or keep an erection, decreases vaginal lubrication in women, and makes orgasm more difficult to achieve in both sexes. Chronic overuse of alcohol reduces testosterone in men, ultimately causing erectile dysfunction, infertility, and body changes such as enlarged breasts. Women who overuse alcohol often experience menstrual

abnormalities and decreased sexual function. Similarly, cigarette smoking has a powerful negative effect on sexual function, primarily because it decreases blood flow to the genitals.

connect™

Connect to Your Choices



Have you ever thought about why you handle your sexuality and sexual relationships the way you do? Many factors can influence the sexual choices we make, some not as obvious as others. Do you feel you have to be sexually active because your peers and potential partners are? Do you compare your body or your sexual behaviors to what you see in movies or on TV? Do you base your sexual decision making on the religious teachings with which you were brought up?

What are the external factors that influence your choices about your sexuality? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

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Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION



If you are sexually active or plan to become active soon, how open have you been in communicating with your partner? Are you aware of your partner’s feelings about sex and his or her comfort level with certain activities? Do you and your partner share the same views on contraception, STD prevention, and ethical issues about sex?

TIPS FOR TODAY AND THE FUTURE

A healthy sexual life is built on acceptance of yourself and good communication with your partner.

RIGHT NOW YOU CAN:

- Deal with any sexual question or problem you've been avoiding. A good place to start is by talking with your doctor. Don't be afraid or embarrassed to ask questions.
- Articulate to yourself exactly what your beliefs are about sexual relationships. Consider whether you are acting in accordance with your beliefs.
- If you're in a sexual relationship, consider the information you and your partner have shared about sex. Are you comfortable that you and your partner know enough about each other to have a safe, healthy sexual relationship?

IN THE FUTURE YOU CAN:

- If you're in a sexual relationship, or if you plan to begin one, open (or reopen) a dialogue with your partner about sex. Make time to talk at length about the responsibilities and consequences of a sexual relationship.

SUMMARY

- The female external sex organs are called the vulva; the clitoris plays an important role in sexual arousal and orgasm.
- The vagina leads to the internal female sex organs, including the uterus, oviducts, and ovaries.
- The male external sex organs are the penis and the scrotum; the glans of the penis is an important site of sexual arousal.
- Male internal sexual structures include the testes, vasa deferentia, seminal vesicles, and prostate gland.
- The fertilizing sperm determines the sex of the individual. Specialized genes on the Y chromosome initiate the process of male sexual differentiation in the embryo.
- Hormones initiate the changes that occur during puberty: the reproductive system matures, secondary sex characteristics develop, and the bodies of males and females become more distinctive.
- The menstrual cycle has four phases: menses, the estrogenic phase, ovulation, and the progesterational phase.
- The ovaries gradually cease to function as women approach age 50 and enter menopause. The pattern of male sexual responses changes with age, and testosterone production gradually decreases.
- Sexual activity is based on stimulus and response. Stimulation may be physical or psychological.
- Vasocongestion and muscle tension are the primary physiological mechanisms of sexual arousal.

- The sexual response cycle has four stages: excitement, plateau, orgasm, and resolution.
- Physical and psychological problems can both interfere with sexual functioning.
- Treatment for sexual dysfunction first addresses any underlying medical conditions and then looks at psychosocial problems.
- Some gender characteristics are determined biologically, and others are defined by society. Children learn traits and behaviors traditionally deemed appropriate for one sex or the other.
- The ability to respond sexually is present at birth. Sexual behaviors emerging in childhood include self-exploration, perhaps leading to masturbation.
- Although puberty defines biological adulthood, people take 5–10 more years to reach social maturity.
- Sexual fantasies and dreams and nocturnal emissions characterize adolescent sexuality.
- A person's sexual orientation can be heterosexual, homosexual, or bisexual. Possible influences include genetics, hormonal factors, and early childhood experiences.
- Human sexual behaviors include celibacy, erotic fantasy, masturbation, touching, cunnilingus, fellatio, anal intercourse, and coitus.
- To evaluate whether an atypical sexual behavior is problematic, experts consider the issues of consent between partners and whether the behavior results in physical or psychological harm.
- Pornography and prostitution are examples of the commercialization of sex; sexual stimulation is exchanged for money.
- Responsible sexuality includes open, honest communication; agreed-on sexual activities; sexual privacy; using contraception; safe sex practices; sober sex; and taking responsibility for consequences.

FOR MORE INFORMATION

BOOKS

- Bogle, K. 2008. *Hooking Up: Sex, Dating and Relationships on Campus*. New York: New York University Press. A sociologist looks at the "hookup" culture on college campuses today.
- Kelly, G. F. 2011. *Sexuality Today*, 10th ed. New York: McGraw-Hill. An accessible approach that highlights cross-cultural examples, popular topics and issues, and case studies featuring college-age individuals.
- Marcus, E. 2005. *Is It a Choice? Answers to 300 of the Most Frequently Asked Questions about Gays and Lesbian People*, 3rd ed. San Francisco: Harper. Candid and informative information on coming out, family roles, and politics.
- Meston, C., and D. Buss. 2009. *Why Women Have Sex*. New York: Times Books. Fascinating, readable, yet scholarly book about all aspects of female sexuality, especially sexual desire.
- Omoto, A. M., and H. S. Kurtzman, eds. 2006. *Sexual Orientation and Mental Health: Examining Identity and Development in Lesbian, Gay, and Bisexual People*. Washington, DC: American Psychological Association.

Covers topics in mental health as well as sexual behavior and the well-being of children of same-sex couples.

Strong, B., et al. 2008. *Human Sexuality: Diversity in Contemporary America*, 6th ed. New York: McGraw-Hill. A comprehensive introduction to human sexuality.

Taverner, W. J. 2009. *Taking Sides: Clashing Views on Controversial Issues in Human Sexuality*, 11th ed. New York: McGraw-Hill. Includes pro and con position statements on sexuality issues relating to biology, behavior, and legal and social issues.

ORGANIZATIONS AND WEBSITES

American Association of Sex Educators, Counselors, and Therapists (AASECT). Certifies sex educators, counselors, and therapists and provides listings of local therapists dealing with sexual problems. <http://www.aasect.org>

American Psychological Association: Information about gender identity and sexual orientation. Question-and-answer format sections on transgender and homosexuality. <http://www.apa.org/topics/sexuality/transgender.aspx>

Center for Young Women's Health. Includes information about topics such as menstruation, gynecological exams, eating disorders, body piercing, and sexual health. <http://www.youngwomenshealth.org>

Children Now: Talking with Kids. Provides advice for parents about talking with children about difficult issues, including sex, relationships, and STDs. http://www.childrennow.org/index.php/learn/talking_with_kids/

The Kinsey Institute for Research in Sex, Gender, and Reproduction. One of the oldest and most respected institutions doing research on sexuality. <http://www.kinseyinstitute.org>

Sexuality Information and Education Council of the United States (SIECUS). Provides information about many aspects of sexuality and has an extensive library and numerous publications. <http://www.siecus.org>

See also the listings for Chapters 4, 6–8, and 18.

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A collection of various contraceptive methods is displayed on a dark background. In the upper left, a clear plastic condom is shown with a yellow ring at its top. To its right is a crumpled, clear plastic condom wrapper. Below the condom, a blue plastic pill dispenser is visible, containing several white, oval-shaped pills. In the bottom right corner, a pink plastic diaphragm is shown, with a yellow ring around its central opening. A small white tube with a white cap is partially visible on the right side of the image.

Contraception

LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain how contraceptives work
- Interpret information about a contraceptive method's effectiveness, risks, and benefits
- List the most popular contraceptives and discuss their advantages, disadvantages, and effectiveness
- Discuss issues related to contraception, including nonmarital sexual relationships, gender differences, sex education for teenagers, and communication between partners
- Choose a method of contraception based on the needs of the user and the safety and effectiveness of the method

TEST YOUR KNOWLEDGE

1. Which of the following contraceptive methods offers the best protection against pregnancy?
 - a. Oral contraceptives
 - b. Injectable contraceptives
 - c. Male condoms
 - d. Diaphragm with spermicidal foam
2. Sperm can survive only about 24 hours inside a woman's body. True or false?
3. Hand lotion and baby oil are good condom lubricants. True or false?
4. Worldwide, which of the following is the most commonly used contraceptive method?
 - a. Oral contraceptives
 - b. Sterilization
 - c. Condoms
 - d. Diaphragms
5. Emergency contraception is now available without a prescription to individuals 17 and older. True or false?

ANSWERS

1. **B.** Injectable contraceptives are the most effective at preventing pregnancy.
2. **FALSE.** Sperm usually live about 72 hours within the woman's body, but can live up to six or seven days.
3. **FALSE.** Only water-based lubricants such as K-Y Jelly or Astroglide should be used as condom lubricants. Any product that contains mineral oil can cause latex condoms to disintegrate.
4. **B.** Worldwide, sterilization is the most popular method of contraception. Although male sterilization is less expensive and less prone to complications, female sterilization is far more common.
5. **TRUE.** Two brands of emergency contraceptives—Plan B One-Step and Next Choice—can be purchased by men and women ages 17 and older without a prescription.

People have always had a compelling interest in managing fertility and preventing unwanted pregnancies, a practice commonly known as **birth control**. Records dating to the fourth century BC describe the use of foods, herbs, drugs, douches, and sponges to prevent **conception**, which is the fusion of an ovum and sperm that creates a fertilized egg, or *zygote*. Early attempts at **contraception** (blocking conception through the use of a device, substance, or method) were based on the same principle as many modern birth control methods.

Today women and men can choose from many different types of **contraceptives** to avoid unwanted pregnancies.

Modern contraceptives take a wide variety of forms and work in different ways. Modern contraceptive methods are much more predictable and effective than in the past, and people in developed countries now have many options when it comes to making decisions about their sexual and contraceptive behavior.

Worldwide, however, the situation is quite different. People in many countries have little access to contraceptive information and supplies. Recent studies estimate that 86 million women worldwide have unintended or unwanted pregnancies every year, resulting in nearly 41 million abortions. Additionally, 385,000 women died from complications due to

Table 6.1

Intended and Unintended Pregnancies in the United States: 2006

Total pregnancies	6,658,000
Intended	51%
Unintended	49%
Unintended pregnancies ending in abortion	43%
Pregnancy rate*	66.7
Abortion rate*	16
Unintended birth rate*	25

*Per 1000 women.

SOURCE: Reprinted from *Contraception*, 84(5), Finer, L. B., and M. R. Zolna, "Unintended pregnancy in the United States: Incidence and disparities," pp. 478–485. Copyright © 2011 with permission from Elsevier.

pregnancy and childbirth in 2008, with the vast majority of these deaths occurring in developing nations. Table 6.1 shows the numbers of intended and unintended pregnancies in the United States in 2006, the most recent year for which complete data are available. Nearly half of all pregnancies were unintended; of those, 43% ended in abortion. (Abortion is discussed in detail in Chapter 7.)

In addition to preventing pregnancy, many contraceptive products play an important role in protecting against **sexually transmitted diseases or STDs**. (Chapter 18 provides a comprehensive overview of STDs.) Being informed about the realities and risks and making responsible decisions about sexual and contraceptive behavior are crucial components of lifelong wellness. But because such decisions can be emotional, complex, and difficult, some people avoid them or deal with them ineffectively.

Biological, social, and media pressures encourage sexual activity at ever-younger ages. There has been much debate in the media and the government regarding the most appropriate methods of sexual education; some argue for abstinence-only education, while others favor comprehensive instruction on contraception and STD prevention within schools. Regardless of this ongoing debate, however, the United States has one of the highest teen pregnancy rates of all developed nations. Because many women's lives are significantly affected by unplanned child rearing and because the option of abortion is becoming more restricted, the problem of unplanned, unwanted pregnancies is more serious than the numbers show.

PRINCIPLES OF CONTRACEPTION

To understand how contraception works, one must first understand the process required for conception. A man's sperm must survive the acidic environment of the vagina and pass through the thickened cervical mucus at the entrance to the

uterus. The sperm must then travel into the fallopian tube to meet an unfertilized ovum (egg). A woman's ovaries release one egg each month into one of the fallopian tubes, as long as the woman's hormones have supported the process of ovulation. Once fertilization occurs in the fallopian tube and a zygote is formed, the zygote must then travel back through the fallopian tube to implant within the endometrium (the lining of the inside of the uterus).

Contraception can work at each of the points along this pathway by preventing sperm from entering the vagina or passing through the cervix, by preventing ovulation, by blocking the fallopian tubes, or by altering the endometrium to prevent implantation of a fertilized egg.

Effective approaches to contraception include the following:

- **Barrier methods** work by physically blocking the sperm from reaching the egg. Condoms are the most popular method based on this principle.
- **Hormonal methods**, such as oral contraceptives (birth control pills), alter the biochemistry of the woman's body, preventing ovulation (the release of the egg) and producing changes that make it more difficult for the sperm to reach the egg if ovulation does occur.
- **Natural methods** of contraception are based on the fact that the egg and the sperm have to be present at the same time if fertilization is to occur; intercourse is avoided around the time of ovulation.
- **Surgical methods**—female and male sterilization—permanently prevent the union of sperm and eggs.

TERMS

birth control The practice of managing fertility and preventing unwanted pregnancies.

conception The fusion of ovum and sperm, resulting in a fertilized egg, or *zygote*.

contraception The prevention of conception through the use of a device, substance, or method.

contraceptive Any agent or method that can prevent conception.

sexually transmitted disease (STD) Any of several contagious diseases contracted through intimate sexual contact.

barrier method A contraceptive that acts as a physical barrier, blocking sperm from uniting with an egg.

hormonal method A contraceptive that alters the biochemistry of a woman's body, preventing ovulation and making it more difficult for sperm to reach an egg if ovulation does occur.

natural method An approach to contraception that does not use drugs or devices; requires avoiding intercourse during the period of the woman's menstrual cycle when an egg is most likely to be present at the site of conception and the risk of pregnancy is greatest.

surgical method Sterilization of a male or female to permanently prevent the transport of sperm or eggs to the site of conception.



WELLNESS ON CAMPUS

Contraception Use and Pregnancy among College Students

College tends to be a time of increased sexual activity for many young adults. Those who were sexually active in high school may have an increased number of partners or engage in riskier sexual behaviors once they enter college; those who abstained from intercourse during high school may begin to explore their sexuality once they enter this new environment. Surveys have shown that the majority of college students, up to 70%, engage in sexual activity, and some have more than one partner.

Though sexual activity significantly increases during the college years, a large percentage of students report not using contraception during their most recent sexual activity. The same study cited above found that only 56% of students used contraception during their most recent intercourse. Oral contraceptive pills were the most commonly used contraceptive, with about 60% of women utilizing a contraceptive selecting this method; males who utilized a contraceptive at last intercourse reported having used the male condom approximately 66% of the time. Of note, the withdrawal method was used by 27% of respondents; this method does not protect against STDs and has a high associated failure rate.

Black and white college students differ somewhat in contraceptive use. Black students were more likely to have used a condom the last time they had vaginal intercourse compared with white students (63% of blacks versus 58% of whites). On the other hand, white students were far more likely to use hormonal contraception than black students (66% versus 42%). About 6% of black students reported using no contraception the last time they had vaginal intercourse, compared with fewer than 3% of white students. Unintended pregnancies were nearly four times higher among black college students compared with white students.

While the oral contraceptive pill is a highly effective form of contraception when used as directed, and the male condom is

effective at preventing the transmission of a wide variety of STDs, they must be used together to provide simultaneous protection against both pregnancy and STDs. This is particularly important for couples that are not in a long-term, mutually monogamous relationship. However, surveys show that college students use a male condom plus another form of contraception only about 45% of the time.

Around 2% of college women report having become pregnant in the prior year, many unintentionally. A disproportionate number of these pregnancies occur in students within community colleges; a 2007 survey found that 5.3% of attendees at community colleges reported a pregnancy during the year prior, while only 1.8% of students at four-year universities reported the same.

The consequences of pregnancy among college students can be significant. For example, one study found that 61% of women who became pregnant while attending community college subsequently dropped out. Those who continue their education face added expenses and stress. Given the importance of education in achieving long-term career and financial goals, the implementation of effective contraception during the college years can have a significant impact on the lives of young women. Unfortunately only 42% of students report being provided any information about pregnancy prevention by their college.

SOURCES: U.S. Department of Education, National Center for Education Statistics. 2002. *Short-Term Enrollment in Postsecondary Education: Student Background and Institutional Differences in Reasons for Early Departure, 1996–98*, NCES 2003–2153. Washington, DC: U.S. Department of Education; American College Health Association. 2011. *National College Health Assessment: Reference Group Executive Summary Spring 2011* (http://www.acha-ncha.org/docs/ACHA-NCHA-II_ReferenceGroup_ExecutiveSummary_Spring2011.pdf).

All contraceptive methods have advantages and disadvantages that make them appropriate for some people but not for others, and the best choice during one period of life may not be the best in another. Factors that affect the choice of method include effectiveness, convenience, cost, reversibility, side effects and risks, and protection against STDs. This chapter helps you sort through these factors to decide which contraceptive method is best for you.

Contraceptive effectiveness is partly determined by the reliability of the method itself—the failure rate if it were always used exactly as directed (“perfect use”). Effectiveness is also determined by characteristics of the user, including fertility of the individual, frequency of intercourse, and how consistently and correctly the method is used. This “typical use” **contraceptive failure rate** is based on studies that directly measure the percentage of women experiencing an unintended pregnancy

QUICK STATS

About **400** eggs are released through ovulation during a woman's fertile life.

—American College of Obstetricians and Gynecologists, 2012

in the first year of contraceptive use. For example, the 9% failure rate of oral contraceptives means 9 out of 100 typical users will become pregnant in the first year. This failure rate is likely to be lower for women who are consistently careful in following instructions and higher for those who are frequently careless; the “perfect use” failure rate is 0.3%.

Another measure of effectiveness is the **continuation rate**—the percentage of people who continue to use the method after a

contraceptive failure rate The percentage of women using a particular contraceptive method who experience an unintended pregnancy in the first year of use.

continuation rate The percentage of people who continue to use a particular contraceptive after a specified period of time.

TERMS



A careful explanation by a health care professional will help this young woman choose a contraceptive method that is right for her.

specified period of time. This measure is important because many unintended pregnancies occur when a method is stopped and not immediately replaced with another. Thus a contraceptive with a high continuation rate would be more effective at preventing pregnancy than one with a low continuation rate. A high continuation rate also gives an indication of user satisfaction with a particular method.

REVERSIBLE CONTRACEPTION

Reversibility is an extremely important consideration for young adults when they choose a contraceptive method because most people either plan to eventually have children or at least want to keep their options open until later in life.

Oral Contraceptives: The Pill

About a century ago, a researcher noted that ovulation does not occur during pregnancy. Further research revealed the hormonal mechanism: during pregnancy, the corpus luteum secretes progesterone and estrogen in amounts high enough to suppress ovulation. (See Chapter 5 for a complete discussion of the menstrual cycle.) **Oral contraceptives (OCs)**, also known as *birth control pills* or “the pill,” prevent ovulation by mimicking the hormonal activity of the corpus luteum. The active ingredients in OCs are estrogen and progestins,

laboratory-made compounds that are closely related to progesterone. Today OCs are the most widely used form of contraception among unmarried women and are second only to sterilization among married women.

In addition to preventing ovulation, the birth control pill has other contraceptive effects. It inhibits the movement of sperm by thickening the cervical mucus, alters the rate of ovum transport by means of its hormonal effects on the fallopian tubes, and may prevent implantation by changing the lining of the uterus in the unlikely event that a fertilized ovum reaches that area.

The Combination Pill The most common type of OC is the *combination pill*, which contains varying amounts of estrogen and progestin. Traditionally each one-month packet has contained a three-week supply of “active” pills that combine varying types and amounts of estrogen and progestin, as

oral contraceptive (OC) Hormone compounds (made of estrogen and progestins) in pill form that prevent conception by preventing ovulation; also called the *birth control pill* or “the pill.”

TERMS



Reversible hormonal contraceptives are available in several forms. Shown here are the patch, the ring, and birth control pills.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Prior to reading this section, how familiar were you with the principles of contraception? Did you know as much as you thought? Were you aware of the large number of contraceptive options that are currently available?

well as a one-week supply of “placebo” pills that do not contain hormones. Increasingly, however, combination pills are offering different schedules, including 24 active pills and 4 placebo pills, and 84 active pills and 7 placebo pills. During the time in which no hormones are taken, a light menstrual period occurs. The newer schedules allow a decreased frequency of menstrual periods. However, a side effect of these extended-cycle regimens is unpredictable light bleeding (known as *spotting*).

So far, altering the menstrual cycle has not been linked with any major health risks, but some experts are concerned that the suppression of menstruation for most of a woman’s reproductive years could become commonplace and may result in unanticipated health problems in the future. Research is ongoing, but it may take many years to fully evaluate the consequences of suppressing menstruation for long periods of a woman’s life.

The Minipill A much less common type of OC is the *minipill*, a small dose of a synthetic progesterone taken every day of the month. Because the minipill contains no estrogen, it has fewer side effects and health risks, but it is associated with more irregular bleeding patterns. Additionally, it must be taken at the same time every day to maintain efficacy. It is sometimes prescribed for women who are breastfeeding or have medical problems that make it unsafe for them to take estrogen.

How Oral Contraceptives Are Used A woman is usually advised to start the first cycle of pills with a menstrual period to increase effectiveness and eliminate the possibility of unsuspected pregnancy. If pregnancy has been ruled out, the pill can be started immediately, but a backup contraceptive method, such as condoms, should also be used during the first week. She must take each month’s pills completely and according to instructions. Taking a few pills just prior to having sexual intercourse does not provide effective contraception. Linking pill taking to part of their regular routine, such as tooth brushing, helps many women remember to take their pills the same time every day.

During the first cycle or two, hormonal adjustments may cause slight bleeding between periods. This spotting is considered normal. If the pill is not started with a menstrual period, full effectiveness cannot be guaranteed during the first week. A backup contraceptive method is recommended during the first week and any subsequent cycle in which the woman forgets to take any pills.

OC use was once linked to an increased risk of heart attack and stroke. However, these risks have been significantly reduced by the use of lower-dosage pills (those with 50 micrograms or less of estrogen) and the identification of women at higher risk for complications.

Advantages Oral contraceptives are very effective in preventing pregnancy. Nearly all unplanned pregnancies result because the pills were not taken as directed. The pill is relatively simple to use and does not hinder sexual spontaneity.

For many women, a big advantage of oral contraceptives is their reversibility; fertility returns after a woman stops taking the pill.

Most women also appreciate the predictable regularity of periods, as well as the reduction in cramps and blood loss. Women who have significant problems associated with menstruation may benefit from menstrual suppression with extended-cycle OCs. For young women, the pill’s reversibility is especially important; **fertility**—the ability to reproduce—returns after the pill is discontinued.

Medical advantages include a decreased incidence of benign breast disease, acne, iron-deficiency anemia, ectopic pregnancy, colon and rectal cancer, endometrial cancer (in the lining of the uterus), and ovarian cancer.

Women who have ever taken the pill have a 50% lower risk of endometrial cancer, and those who use the pill long-term (more than five years) reduce their risk even further. The risk of ovarian cancer drops by 20% for every five years of pill use, and some doctors recommend OC use as a preventive measure for women at high genetic risk for ovarian cancer. Some studies have shown that OCs also reduce the risk of colon cancer by about 18% in current and recent users.

OC use reduces dysmenorrhea (painful periods), endometriosis, and polycystic ovary syndrome. Health care providers prescribe OCs to treat other medical problems such as menstrual migraine, adenomyosis, and heavy perimenopausal bleeding.

Disadvantages Although oral contraceptives are effective in preventing pregnancy, they do not protect against STDs. OCs have been associated with increased risk of cervical chlamydia in some studies but not in others. Regular condom use is strongly recommended for an OC user unless she is in a long-term, mutually monogamous relationship with an uninfected partner.

The hormones in birth control pills influence many tissues in the body and can lead to a variety of side effects, most of which are minor. The majority of women do not experience any side effects associated with OC use. Among women who experience problems with OCs, the most common issue is bleeding during midcycle (called *breakthrough bleeding*), which is usually slight and tends to disappear after a few cycles. Symptoms of early pregnancy—such as morning nausea and swollen breasts—may appear during the first few months of OC use, although these side effects are uncommon with the low-dose pills in current widespread use. Other side effects can include depression, nervousness, changes in sex drive, dizziness, generalized headaches, migraine, and vaginal discharge. Acne may develop or worsen when women take OCs, but most women find their acne improves when they take the pill. In fact, OCs are frequently prescribed as a treatment for acne.

Older OCs with high-dose hormones were sometimes associated with weight gain. However, research shows that currently used low-dose OCs do not, on average, cause weight

fertility The ability to reproduce.

TERMS

gain. Most women experience no change in their weight, while a small percentage lose weight, and about an equal percentage gain weight while taking OCs. The myth that OCs cause women to gain weight is actually dangerous because many unintended pregnancies have resulted when women avoided taking OCs due to unfounded fear of weight gain.

Another myth about OCs is that they can cause cancer. Actually, taking the pill greatly reduces a woman's risk for endometrial and ovarian cancers. OC use is associated with little, if any, increase in breast cancer and a slight increase in cervical cancer, but earlier detection and other variables (such as a woman's number of sexual partners) may account for much of this increase.

Serious OC side effects have been reported in a small number of women. These include blood clots, stroke, and heart attack, concentrated mostly in older women who smoke or have a history of circulatory disease. Recent studies have shown no increased risk of stroke or heart attack for healthy, young, nonsmoking women on lower-dosage pills. OC users may be slightly more prone to high blood pressure, gallbladder disease, and, very rarely, benign liver tumors.

Birth control pills are not recommended for women with a history of blood clots (or a close family member with unexplained blood clots at an early age), heart disease or stroke, migraines with changes in vision, any form of cancer or liver tumor, or impaired liver function. Women with certain other health conditions or behaviors, including migraines without changes in vision, high blood pressure, cigarette smoking, and sickle-cell disease, require close monitoring when taking the pill.

When deciding whether to use OCs, each woman needs to weigh the benefits against the risks. To make an informed decision, she should begin by getting advice from a health care professional (see the box "Obtaining a Contraceptive from a Health Clinic or Physician"). If you take the pill, you can take several steps to reduce the risks associated with OC use:

1. Request a low-dosage pill. (OCs recommended for most new users contain 20–35 micrograms of estrogen.)
2. Stop smoking.
3. Follow the directions carefully and consistently, making sure to take the pills at the same time every day.
4. Be alert to preliminary danger signals, which can be remembered by the word ACHES:
 - Abdominal pain (severe).
 - Chest pain (severe), cough, shortness of breath, or sharp pain on breathing in.
 - Headaches (severe), dizziness, weakness, or numbness, especially if one-sided.
 - Eye problems (vision loss or blurring) and/or speech problems.
 - Severe leg pain (calf or thigh).
5. Make sure your health practitioner knows your personal and family medical history to help determine whether OCs may be unsafe for you.

Table 6.2

Risks of Contraception, Pregnancy, and Abortion

CONTRACEPTION	RISK OF DEATH
Oral contraceptives	
Nonsmoker	
Age 15–34	1 in 1,667,000
Age 35–44	1 in 33,300
Smoker	
Age 15–34	1 in 57,800
Age 35–44	1 in 5,200
IUDs	1 in 10,000,000
Barrier methods, spermicides	None
Fertility awareness–based methods	None
Tubal ligation	1 in 66,700
PREGNANCY	RISK OF DEATH
Pregnancy	1 in 6,900
ABORTION	RISK OF DEATH
Spontaneous abortion	1 in 142,900
Medical abortion	1 in 200,000
Surgical abortion	1 in 142,900

SOURCE: Hatcher, R. A., et al. *Contraceptive Technology*, 20th revised edition. Copyright © 2011 Ardent Media. Reprinted with permission.

6. Have regular **Pap tests**, pelvic exams, and breast exams as recommended by your health practitioner.

For the vast majority of young women, the known, directly associated risk of death from taking birth control pills is much, much lower than the risk of death from pregnancy (Table 6.2). Overall, OC risks are generally very small unless you are over 35, are a smoker, and/or have specific medical problems.

Effectiveness Oral contraceptive effectiveness varies substantially because it depends so much on individual factors. If taken exactly as directed, its failure rate is extremely low (0.3%). Among average users, however, lapses such as forgetting to take a pill do occur, and the typical first-year failure rate is 9%. The continuation rate for OCs also varies; the average rate is 67% after one year. Besides forgetting to take the pill, another reason for OC failure is poor absorption of the drug due to vomiting or diarrhea, or to interactions with other medicines (including certain antibiotics, antiseizure medications, and the commonly used herb St. John's wort).

Contraceptive Skin Patch

The contraceptive skin patch, Ortho Evra, is a thin, 1¾-inch square patch that slowly releases an estrogen and a progestin into the bloodstream. The contraceptive patch prevents

Pap test A scraping of cells from the cervix for examination under a microscope to detect cancer.

TERMS



CRITICAL CONSUMER

Obtaining a Contraceptive from a Health Clinic or Physician

If you are a woman considering a method of contraception that requires a prescription or professional fitting or insertion, you'll need to go to a health clinic or a physician to get it. Many of the female contraception methods—including hormonal methods, IUDs, diaphragms, and cervical caps—require at least an initial professional visit.

The thought of visiting a physician's office or health clinic to discuss and obtain contraception makes many people nervous. Remember that the people in the office are health care professionals who will not pass moral judgment on you. They are dedicated to meeting your health care needs. Knowing what to expect can help you get more from your visit.

Before Your Visit

Prepare for a successful visit by doing the following:

1. Pull together your personal and family medical history. Make sure it's accurate and up to date.
2. Review the section in this chapter titled "Which Contraceptive Method Is Right for You?" Carefully consider each topic, and discuss it with your partner if that would be helpful.
3. Write down any questions you have. Decide what you need to learn about your contraceptive options.
4. If you have questions about sexually transmitted diseases or other aspects of sexuality, write those down, too.
5. If you like, plan to have your partner, a friend, or a family member accompany you to your appointment.

During Your Visit

When you arrive, you'll probably be asked to fill out forms detailing your background and medical history. A physician or staff

member will then review the various contraceptive methods with you and answer your questions. She or he can help you evaluate the key factors affecting your choice of method, including health risks, lifestyle factors, cost, and protection against STDs. Blood and urine samples may be taken for lab tests.

The Physical Exam

Your physical exam will probably include a check of your breasts, external genitals, and abdomen, plus a Pap test and possible screening for certain STDs. The exam will help ensure that you can safely use the contraceptive method you have chosen, as well as protect your overall health. If this is your first pelvic exam and/or you feel nervous or uncomfortable, tell the clinician, and ask her or him to explain each step of the examination.

For the pelvic exam, you will be asked to lie on your back on an examination table, with your feet in stirrups and your knees bent and spread apart. The exam doesn't usually hurt. An instrument called a *speculum* will be inserted into the vagina to hold it open so the clinician can look at the cervix and vaginal walls. For the Pap test, the clinician will scrape some cells from the cervix and place them on a glass slide. These cells will be analyzed for any signs of cancer. You may feel a slight pressure while the cells are collected. The clinician will also check your internal organs by placing two gloved fingers into the vagina and the other hand on the lower abdomen. He or she will palpate (examine by touching) the uterus and ovaries to check for any abnormalities.

If you're getting a diaphragm or a cervical cap, you will be fitted for it at this time. The clinician will probably try different sizes to find the best fit and then will show you how to insert and remove it.

Following Your Exam

After your exam, a health care worker will either provide you with your contraceptive, arrange for a further appointment (if necessary), or give you a prescription. Make sure you know exactly how to use the method you've chosen. Written instructions and information should be available. Be sure to ask for a phone number you can call if you have questions later.

QUICK

STATS

The contraceptive patch may be less effective when used by women weighing more than 198 pounds.

—National Institutes of Health, 2010

pregnancy in the same way as combination OCs, following a similar schedule. Each patch is worn continuously for one week and is replaced on the same day of the week for three consecutive weeks. The fourth week is patch-free, allowing a woman to have her menstrual period.

The patch can be worn on the upper outer arm, abdomen, buttocks, or upper torso (excluding the breasts); it is designed to stick to skin even during bathing or swimming. If a patch should fall off for more than a day, the FDA advises starting a new four-week cycle of patches and using a backup method of contraception for the first week. Patches should be

discarded according to the manufacturer's directions to avoid leakage of hormones into the environment.

Advantages With both perfect and typical use, the patch is as effective as OCs in preventing pregnancy. Compliance seems to be higher with the patch than with OCs, probably because the patch requires weekly instead of daily action. Medical benefits are comparable to those of OCs.

Disadvantages Like other hormonal contraceptives, the patch doesn't protect against STDs. Patch users should also use condoms for

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The contraceptive skin patch can be worn on several different parts of a woman's body.

STD protection unless they are in a long-term monogamous relationship with an uninfected partner. Minor side effects are similar to those of OCs, although breast discomfort may be more common in patch users. Some women also experience skin irritation around the patch. More serious complications are thought to be similar to those of OCs, including an increased risk of side effects among women who smoke. However, because Ortho Evra exposes users to higher doses of estrogen than most OCs, patch use may further increase the risk of blood clots (venous thromboembolism). Recent studies show conflicting results regarding the risk of blood clots, but it is possible that the risk is slightly higher with the patch compared to low-dose OCs.

Effectiveness With perfect use, the patch's failure rate is very low (0.3%) in the first year of use. The typical failure rate is approximately 9%, similar to that of the oral contraceptive pill.

Vaginal Contraceptive Ring

The NuvaRing is a vaginal ring that is molded with a mixture of progestin and estrogen. The two-inch ring slowly releases hormones and maintains blood hormone levels comparable to those found with OC use. The ring prevents pregnancy in the same way as OCs. A woman inserts the ring anytime during the first five days of her menstrual period and leaves it in place for three weeks. During the fourth week, when the ring is removed, her next menstrual period occurs. A new ring is then inserted. Rings should be discarded according to the manufacturer's directions to avoid leakage of hormones into the environment.

Backup contraception must be used for the first seven days of the first ring use or if the ring has been removed for more than three hours. A diaphragm is not recommended as a backup contraceptive with the NuvaRing because the ring

may interfere with the placement of a diaphragm. Diaphragms are discussed later in this chapter.

Advantages The NuvaRing offers one month of protection with no daily or weekly action required. It does not require a fitting by a clinician, and exact placement in the vagina is not critical as it is with a diaphragm. Medical benefits are probably similar to those of OCs.

Disadvantages The NuvaRing provides no protection against STDs. Side effects are roughly comparable to those seen with OC use, except for a lower incidence of nausea and vomiting. Other side effects may include vaginal discharge, vaginitis, and vaginal irritation. Medical risks also are similar to those found with OC use.

Effectiveness As with the pill and patch, the perfect use failure rate is around 0.3%. The ring's typical use failure rate is similar to the pill's at 9%.

Contraceptive Implants

Contraceptive implants are placed under the skin of the upper arm and deliver a small but steady dose of progestin



The NuvaRing is worn inside the woman's vagina for three weeks at a time.

(a synthetic progesterone) over a period of years. One such implant, called Implanon, is a single implant that is effective for three years and is considered to be one of the most effective forms of contraception.

The progestins in implants have several contraceptive effects. They cause hormonal shifts that may inhibit ovulation and affect development of the uterine lining. The hormones also thicken the cervical mucus, inhibiting the movement of sperm. Contraceptive implants are best suited for women who wish to have continuous, highly effective, and long-term protection against pregnancy.

Advantages Contraceptive implants are highly effective. After insertion of the implants, no further action is required; contraceptive effects are quickly reversed upon removal. Because implants, unlike the combination pill, contain no estrogen, they carry a lower risk of certain side effects, such as blood clots and other cardiovascular complications. In addition, the progestin is released at a steady rate, in smaller quantities than are found in oral contraceptives. Women who are breastfeeding can use Implanon.

Disadvantages Like the pill, an implant provides no protection against STDs. Although the implants are barely visible, their presence may bother some women. Only specially trained practitioners can insert or remove the implants. The up-front costs associated with the implant, including the cost of the device as well as the practitioner's fees, can be significant; therefore, the device is only cost-effective for users desiring multiple years of contraception. The percentage of cost covered by insurance plans varies greatly.

Common side effects of contraceptive implants are menstrual irregularities, including longer menstrual periods, spotting between periods, or having no bleeding at all. The menstrual cycle usually becomes more regular after

one year of use. Less common side effects include headaches, weight gain, breast tenderness, nausea, acne, and mood swings.

Effectiveness The overall failure rate for Implanon is estimated at about 0.05%. It is one of the most effective methods of contraception and also one of the most discreet.

Injectable Contraceptives

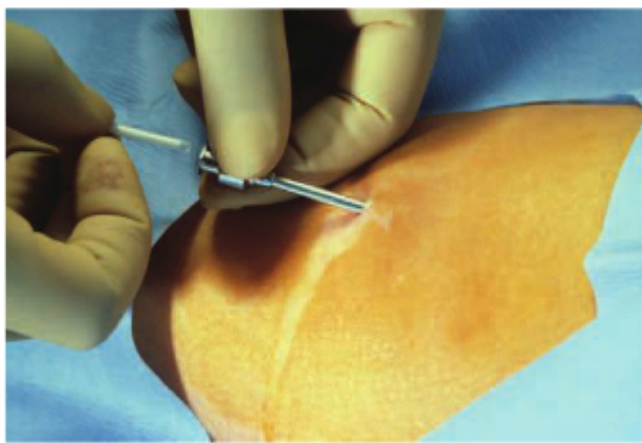
Hormonal contraceptive injections were first developed in the 1960s. The first injectable contraceptive approved for use in the United States was Depo-Provera, which uses long-acting progestins. Injected into the arm or buttocks, Depo-Provera is usually given every 12 weeks, although it may provide effective contraception for a few weeks beyond that. The product prevents pregnancy in the same ways as implants.

Advantages Injectable contraceptives are highly effective and require little action on the part of the user. Because the injections leave no trace and involve no ongoing supplies, injectable contraceptives allow women almost total privacy in their decision to use contraception. Depo-Provera has no estrogen-related side effects. It requires only periodic injections rather than the minor surgical procedures of implant insertion and removal.

Disadvantages Injectable contraceptives provide no protection against STDs. A woman must visit a health care facility every three months to receive the injections. The side effects of Depo-Provera are similar to those of implants; menstrual irregularities are the most common, and after one year of using Depo-Provera many women have no menstrual bleeding at all. Weight gain is a common side effect. After discontinuing the use of Depo-Provera, women may experience temporary infertility for up to 12 months, making it less ideal for women who plan on conceiving in the near future.

Reasons for not using Depo-Provera are similar to those for not using implants. However, Depo-Provera has a unique risk: it can cause a reduction in bone density, especially in women who use it for an extended period. The rate of decline in bone density is most rapid in the first two years of use, and density begins to increase shortly after discontinuation. Decreased bone density is a risk factor for osteoporosis (see Chapter 12) and fractures. But studies have yielded conflicting results as to whether this decreased density actually leads to increased fractures. Women who use Depo-Provera are advised to do weight-bearing exercise and ensure an adequate intake of dietary calcium. Due to conflicting data, the Food and Drug Administration states that women should use Depo-Provera as a long-term contraceptive (longer than two

It's important to remember that hormonal contraceptives provide no protection from STDs.



Only trained health professionals can insert a contraceptive implant.

years, for example) only if other methods are inadequate. However, multiple gynecologic associations believe that the benefits of this highly effective contraception outweigh the theoretical risks, and continuation should not be denied due to concerns regarding bone density.

Effectiveness The perfect use failure rate is 0.2% for Depo-Provera. With typical use, the failure rate increases to 6% in the first year of use.

Intrauterine Devices (IUDs)

An **intrauterine device (IUD)** is a small plastic object placed in the uterus as a contraceptive. Two types of IUDs are now available in the United States: the Copper T-380A (also known as the ParaGard), which provides protection for up to 10 years, and the Levonorgestrel IUD (Mirena), which releases small amounts of progestin and is effective for up to 5 years.

Researchers do not know exactly how IUDs prevent pregnancy. Current evidence suggests that ParaGard works primarily by preventing fertilization. The copper in this IUD may cause biochemical changes in the uterus and affect the movement of sperm and eggs. ParaGard may also interfere with implantation of fertilized eggs. Mirena slowly releases very small amounts of progestin, disrupting ovulation, fertilization, or implantation.

An IUD must be inserted and removed by a trained professional. It can be inserted at any time during the menstrual cycle, as long as the woman is not pregnant. The device is threaded into a sterile inserter, which is introduced through the cervix; a plunger pushes the IUD into the uterus. IUDs have two threads attached that protrude from the cervix into the vagina so a woman can feel them to make sure the device is in place. These threads are trimmed so that only 1–1½ inches remain in the upper vagina (Figure 6.1).

Advantages Intrauterine devices are highly reliable and are simple and convenient to use, requiring no attention except for a periodic check of the string position. They do not require the woman to anticipate or interrupt sexual activity. Multiple studies have also shown a reduction in endometrial cancer rates among Mirena IUD users, and the IUD has even been found to reverse the endometrial changes that precede endometrial cancer. IUDs usually have only localized side effects, and in the absence of complications they are considered a fully reversible contraceptive. In most cases, fertility is restored as soon as the IUD is removed. The risks of ectopic pregnancy and uterine cancer are both decreased with IUD use. The long-term expense of using an IUD is low.

Mirena has the added advantage of greatly decreasing blood flow during menstruation and is often used as a treatment for

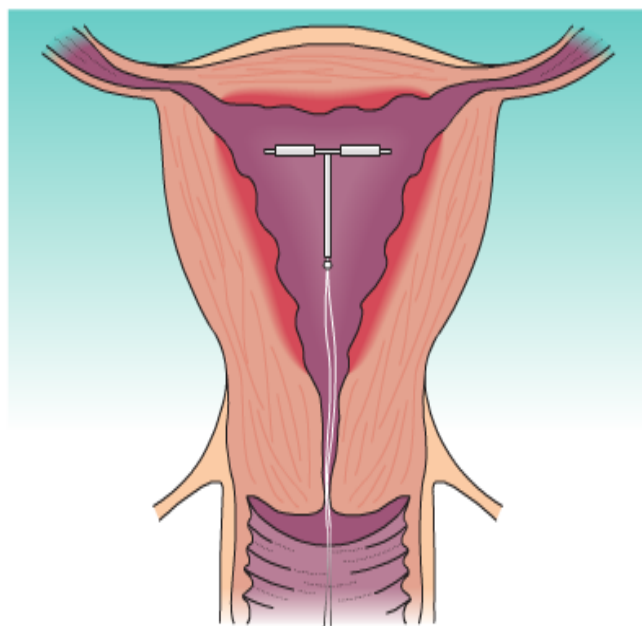


FIGURE 6.1 An IUD (Copper T-380A, or ParaGard) properly positioned in the uterus.

excessive bleeding. In fact, after a year of using Mirena, menstrual bleeding is decreased by about 90%.

Recently studies have shown a protective effect against cervical cancer in IUD users. Although the mechanism of this protection is not fully understood, some researchers think that the IUD may cause inflammation that leads to an enhanced resistance to HPV infection, the causative agent of cervical cancer. However, given that this research is relatively new, this hypothesis warrants further investigation.

Disadvantages The IUD offers no protection against STDs. Most IUD side effects are limited to the genital tract. Side effects differ between the two types of IUD. Heavy menstrual flow and increased menstrual cramping sometimes occur with ParaGard, while Mirena causes a reduction in bleeding and cramping. Most women have light, irregular bleeding during the first few months on Mirena, which tends to decrease over time. Many women stop bleeding altogether after using Mirena for a number of months. Mirena generally reduces menstrual cramps and is often prescribed for that reason. Spontaneous expulsion of the IUD happens to 4–6% of women within the first year, most commonly during the first months after insertion. In rare cases, an IUD can puncture the uterine wall and migrate into the abdominal cavity.

A serious but rare complication of IUD use is pelvic inflammatory disease (PID). Most pelvic infections among IUD users occur shortly after insertion, are relatively mild, and can be treated successfully with antibiotics. Early and adequate treatment is critical—a lingering infection can lead to tubal scarring and subsequent infertility.

Intrauterine device (IUD) A device inserted into the uterus as a contraceptive.

TERMS

For many years, IUD use was not recommended for women who had never had a child. However, extensive research now reveals that the IUD is a safe and highly effective contraceptive in this patient population, and therefore its use can be recommended. But not all practitioners are comfortable placing an IUD in a patient who has not had a child, as the insertion can be more difficult.

IUDs are not suitable for women with suspected pregnancy, large tumors of the uterus, or other anatomical abnormalities, or irregular or unexplained bleeding; Mirena is also not to be used in women with certain hormonally responsive cancers. Early IUD danger signals are abdominal pain, fever, chills, foul-smelling vaginal discharge, and unusual vaginal bleeding. A change in string length may also be a sign of a problem.

Because of the high up-front costs associated with the IUDs, including the cost of the device as well as the practitioner's insertion fee, the IUD is typically most cost-effective for women who desire contraception for many years. The percentage of this cost covered by insurance plans varies greatly.

Effectiveness The typical first-year failure rate of IUDs is 0.8% for the ParaGard and 0.2% for Mirena. Effectiveness can be increased by periodically making sure that the device is in place and by using a backup method for the first week of IUD use. If pregnancy occurs, the IUD may need to be removed to safeguard the woman's health and to maintain the pregnancy; removal depends on the location of the IUD with respect to the pregnancy. If an IUD must be left in place during pregnancy, there is an increased risk of complications.

Male Condoms

The **male condom** is a thin sheath designed to cover the penis during sexual intercourse. Most brands available in the United States are made of latex, although condoms made of polyurethane and polyisoprene are also available. Condoms prevent sperm from entering the vagina and provide protection against STDs. Condoms are the most widely used barrier method and the third most popular of all contraceptive methods used in the United States, after the pill and female sterilization.

Condom sales have increased dramatically in recent years, primarily because they are the only method of contraception that provides substantial protection against HIV infection as well as some protection against other STDs. At least one-third of all male condoms are bought by women. This figure will probably increase as more women assume the right to insist on condom use. Many couples combine various contraceptives, using condoms for STD protection and another contraceptive method for greater protection against pregnancy.

The man or his partner must put the condom on the penis before it is inserted into the vagina because the small amounts of fluid that may be secreted unnoticed prior to



Condoms come in a variety of sizes, textures, and colors. Some brands have a reservoir tip designed to collect semen.

QUICK

STATS

Condom use among teens continues to rise. 8 out of 10 teens now report using a condom the first time they had sex.

—Center for Disease Control, 2011

ejaculation often contain sperm capable of causing pregnancy. The rolled-up condom is placed over the head of the erect penis and unrolled down to the base of the penis, leaving a half-inch space (without air) at the tip to collect semen (Figure 6.2). Some brands of condoms have a reservoir tip designed for this purpose. Uncircumcised men must first pull back the foreskin of the penis. Partners must be careful not to damage the condom with fingernails, rings, or other rough objects.

Many condoms are prelubricated with water-based or silicone-based lubricants. These lubricants make the condom more comfortable and less likely to break. Many people find that using extra, non-oil-based lubricant can be helpful. Prelubricated condoms are also available containing the

male condom A thin sheath that covers the penis during sexual intercourse; used for contraception and to prevent STD transmission.

ejaculation An abrupt discharge of semen from the penis during sexual stimulation.

TERMS

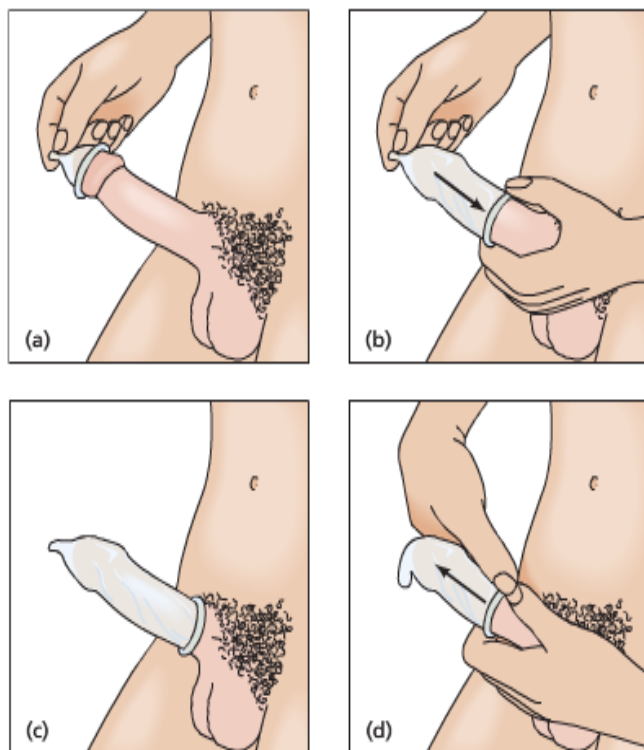


FIGURE 6.2 Use of the male condom. (a) Place the rolled-up condom over the head of the erect penis. Hold the top half-inch of the condom (with air squeezed out) to leave room for semen. (b) While holding the tip, unroll the condom onto the penis. Gently smooth out any air bubbles. (c) Unroll the condom down to the base of the penis. (d) To avoid spilling semen after ejaculation, hold the condom around the base of the penis as the penis is withdrawn. Remove the condom away from your partner, taking care not to spill any semen.

spermicide nonoxynol-9, the same agent found in many of the contraceptive creams that women use. However, spermicidal condoms are no more effective than condoms without spermicide. They cost more and have a shorter shelf life than most other condoms. Further, condoms with nonoxynol-9 have been associated with urinary tract infections in women and, if they cause tissue irritation, an increased risk of HIV transmission. Planned Parenthood and many other public health agencies advise against the use of condoms lubricated with nonoxynol-9.

Water-based lubricants such as K-Y Jelly or Astroglide can be used as needed. Any products that contain mineral or vegetable oil—including baby oil, many lotions, regular petroleum jelly, cooking oils (corn oil, shortening, butter, and so on), and some vaginal lubricants and antifungal or anti-itch creams—should not be used with latex condoms. Such products can cause latex to start disintegrating within 60 seconds, thus greatly increasing the chance of condom breakage. (Polyurethane is not affected by oil-based products.)

spermicide A chemical agent that kills sperm.

TERMS

When the man loses his erection after ejaculating, the condom loses its tight fit. To avoid spilling semen, the condom must be held around the base of the penis as the penis is withdrawn. If any semen is spilled on the vulva, sperm may find their way to the uterus.

Advantages Condoms are easy to purchase and are available without prescription or medical supervision. In addition to being free of medical side effects (other than occasional allergic reactions), latex condoms help protect against STDs. A recent study determined that condoms may also protect women from human papillomavirus (HPV), which causes cervical cancer. Condoms made of polyurethane are appropriate for people who are allergic to latex. However, they are more likely to slip or break than latex condoms, and therefore may give less protection against STDs and pregnancy. Polyurethane condoms are also more expensive than latex condoms. Polyisoprene condoms, marketed under the brand name SKYN, are safe for most people with latex allergies, stretchier, and less expensive than polyurethane condoms. Condoms made of lambskin are also available but permit the passage of HIV and other disease-causing organisms, so they can be used only for pregnancy prevention, not the prevention of STDs. Except for abstinence or intercourse within a monogamous relationship with an uninfected partner, the correct and consistent use of latex male condoms offers the most reliable available protection against the transmission of HIV.

Disadvantages The two most common complaints about condoms are that they diminish sensation and interfere with spontaneity. Although some people find these drawbacks serious, others consider them only minor distractions. Many couples learn to creatively integrate condom use into their sexual practices. Indeed, condom use can be a way to improve communication and share responsibility in a relationship.

Effectiveness In actual use, the failure rate of condoms varies considerably. During the first year of typical condom use among 100 users, approximately 18 pregnancies will occur. With perfect use, the first-year failure rate is only about 2%. At least some pregnancies happen because the condom is carelessly removed after ejaculation. Some may also occur because of breakage or slippage, which may happen 1–2 times in every 100 instances of use for latex condoms and up to 10 times in every 100 instances for polyurethane condoms. Breakage is more common among inexperienced users. Other contributing factors include poorly fitting condoms, insufficient lubrication (which increases the risk of breakage), excessively vigorous sex, and improper storage. (Because heat destroys rubber, latex condoms should not be stored for long periods in a wallet or a car's glove compartment.) To help ensure quality, condoms should not be used past their expiration date or more than five years past their date of manufacture (two years for those with spermicide).

If a condom breaks or is carelessly removed, a woman can reduce the risk of pregnancy somewhat by immediately taking an emergency contraceptive (discussed later in the chapter).

By far the most common cause of pregnancy with condom users is “taking a chance”—that is, occasionally not using a condom at all—or waiting to use it until after preejaculate fluid (which may contain some sperm) has already entered the vagina.

Female Condoms

The female condom is a clear, stretchy, disposable pouch with two rings that can be inserted into a woman's vagina. It was designed as an alternative to the male condom because the woman can control its use. It can be inserted up to eight hours before intercourse, so it need not interfere with the moment. It is about as effective in preventing pregnancy and the spread of STDs as the male condom.

The first version of the female condom was expensive and did not become very popular as a result. A new, more affordable female condom is now available. Called the FC2, it is a one-size-fits-all, disposable device that consists of a soft, loose-fitting, nonlatex rubber sheath with two flexible rings (Figure 6.3). The ring at the closed end is inserted into the vagina and placed at the cervix much like a diaphragm. The ring at the open end remains outside the vagina. The female condom protects the inside of the vagina and part of the external genitalia.

The directions that accompany the FC2 should be followed closely. The manufacturer strongly recommends practicing inserting the female condom several times before actually using it for intercourse. Most women find that it is easy to use after they have practiced inserting the FC2 several times. The FC2 comes prelubricated with a silicone lubricant,

but extra lubricant or a spermicide can be used if desired. As with male condoms, users need to take care not to tear the condom during insertion or removal. Following intercourse, the woman should remove the condom before standing up. By twisting and squeezing the outer ring, she can prevent the spilling of semen. A new condom should be used for each act of sexual intercourse. A female condom should not be used with a male condom because when the two are used together, tearing is more likely to occur.

Advantages For many women, the greatest advantage of the female condom is the control it gives them over contraception and STD prevention. (Partner cooperation is still important, however.) Female condoms can be inserted up to eight hours before sexual activity and are thus less disruptive than male condoms. Because the outer part of the condom covers the area around the vaginal opening as well as the base of the penis during intercourse, it offers potentially better protection against genital warts or herpes. The synthetic rubber pouch can be used by people who are allergic to latex. Because the material is thin and pliable, there is little loss of sensation. The FC2 is generously lubricated and the material conducts heat well, increasing comfort and natural feel during intercourse.

When used correctly, the female condom should theoretically provide protection against HIV transmission and STDs comparable to that of the latex male condom. However, in research involving typical users, the female condom was slightly less effective in preventing both pregnancy and STDs. Effectiveness improves with careful practice and instruction.

Disadvantages The female condom is unfamiliar to most people and requires some practice to learn to use effectively. The outer ring of the female condom, which hangs visibly outside the vagina, may be bothersome to some couples during foreplay; if so, couples may choose to put the device in just before intercourse. During coitus, both partners must take care that the penis is inserted into the pouch, not outside it, and that the device does not slip inside the vagina. Female condoms, like male condoms, are made for one-time use. A single female condom costs about three to four times as much as a single male condom. Female condoms are harder to find than male condoms. Some pharmacies do not currently carry them, but this will change as the FC2 becomes more popular. You can buy the FC2 at Planned Parenthood and online. Go to the FC2 website (<http://www.fc2.us.com/howtogetfc2.html>) for more information about where you can buy the FC2.

Effectiveness The typical first-year failure rate of the female condom is 21%. For women who follow instructions carefully and consistently, the failure rate is considerably lower—about 5%. Female condoms rarely break during use, but slippage occurs in nearly 10% of users. Having emergency contraception available is recommended.

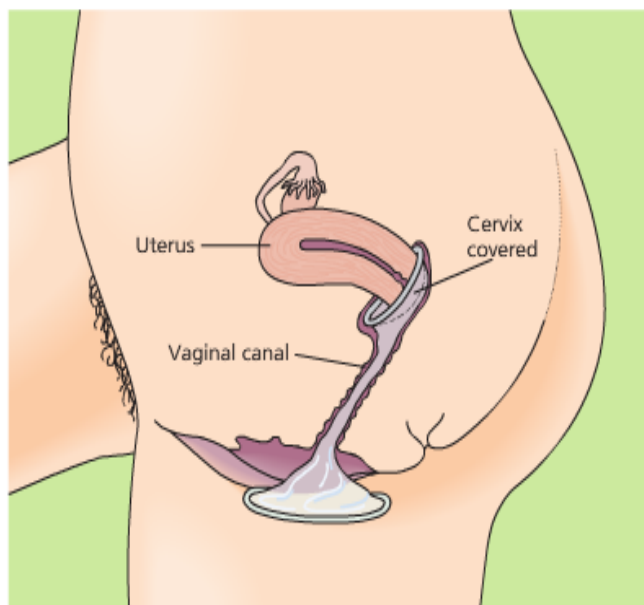


FIGURE 6.3 The female condom properly positioned.

The Diaphragm with Spermicide

Before oral contraceptives were introduced, about 25% of all American couples who used any form of contraception relied on the **diaphragm**. Many diaphragm users subsequently switched to the pill or IUDs, and therefore it is rarely used now. However, the diaphragm still offers advantages that are important to some couples.

The diaphragm is a dome-shaped cup of latex or silicone stretched over a collapsible metal ring. When correctly used with spermicidal cream or jelly, the diaphragm covers the cervix, blocking sperm from the uterus.

Diaphragms are available only by prescription. Because of individual anatomical differences among women, a diaphragm must be carefully fitted by a trained clinician to ensure both comfort and effectiveness. The fit should be checked with each routine annual medical examination, as well as after childbirth, abortion, abdominal or pelvic surgery, or a weight change of more than 10 pounds.

The woman spreads spermicidal jelly or cream on the diaphragm before inserting it and checking its placement (Figure 6.4). If more than six hours elapse between the time of insertion and the time of intercourse, additional spermicide must be applied. The diaphragm must be left in place for at least six hours after the last act of coitus to give the spermicide enough time to kill all the sperm. With repeated intercourse, a condom should be used for additional protection.

To remove the diaphragm, the woman hooks the front rim down from the pubic bone with one finger and pulls it out. After each use, a diaphragm should be washed with mild soap and water, rinsed, patted dry, and examined for holes or cracks. Defects would most likely develop near the rim and can be spotted by looking at the diaphragm in front of a bright light. A diaphragm should be stored in its case.

Advantages Diaphragm use is less intrusive than male condom use because a diaphragm can be inserted up to six hours before intercourse. Its use can be limited to times of sexual activity only, and it allows for immediate and total reversibility. The diaphragm is free of medical side effects (other than rare allergic reactions).

Disadvantages Diaphragms must always be used with a spermicide, so a woman must keep both of these supplies with her whenever she anticipates sexual activity. Diaphragms require extra attention because they must be cleaned and stored with care to preserve their effectiveness. Some women cannot wear a diaphragm because of their vaginal or uterine anatomy. In other women, diaphragm use can cause bladder infections and may need to be discontinued if repeated infections occur.

diaphragm A contraceptive device consisting of a flexible, dome-shaped cup that covers the cervix and prevents sperm from entering the uterus.

TERMS

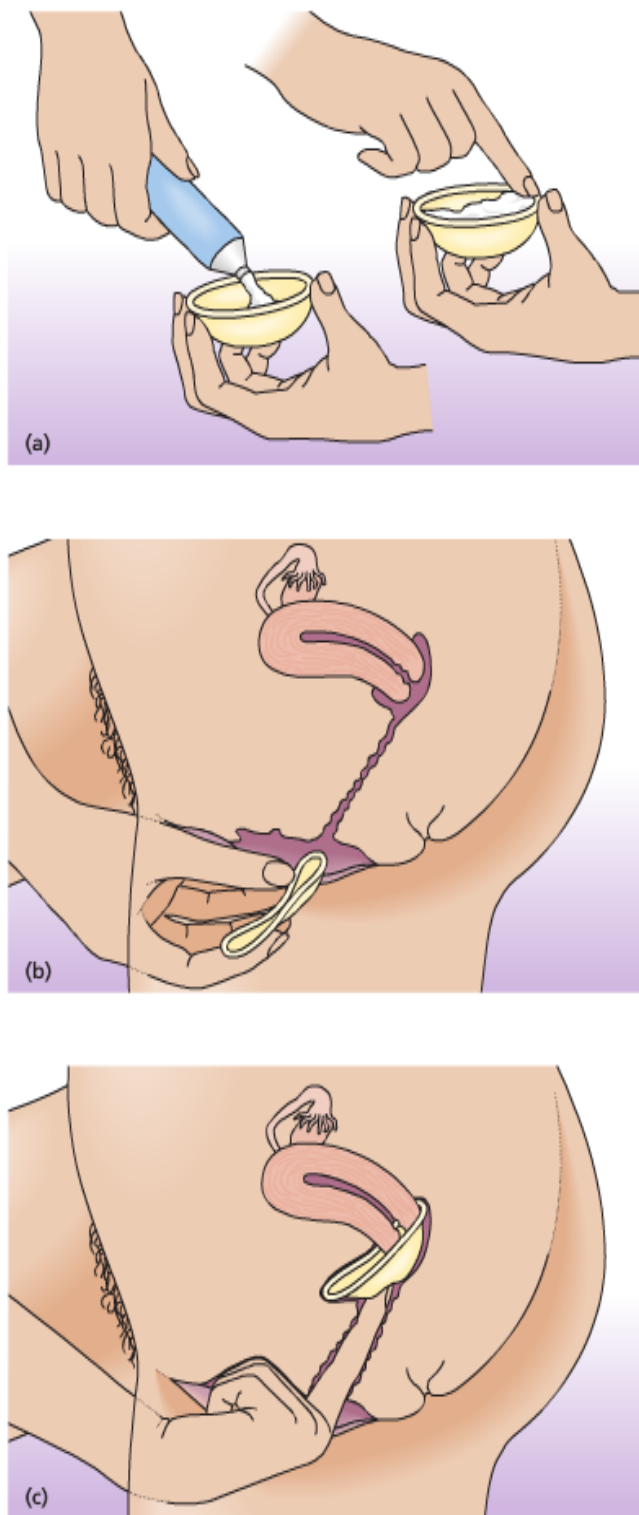


FIGURE 6.4 Use of the diaphragm. Wash your hands with soap and water before inserting the diaphragm. It can be inserted while squatting, lying down, or standing with one foot raised. (a) Place about a tablespoon of spermicidal jelly or cream in the concave side of the diaphragm, and spread it around the inside of the diaphragm and around the rim. (b) Squeeze the diaphragm into a long, narrow shape between the thumb and forefinger. Insert it into the vagina, and push it up along the back wall of the vagina as far as it will go. (c) Check its position to make sure the cervix is completely covered and that the front rim of the diaphragm is tucked behind the pubic bone.



Many contraceptive methods work by blocking sperm from entering the cervix. Barrier methods pictured here are the diaphragm, the female condom, the male condom, the sponge, and the cervical cap.

Diaphragms have also been associated with a slightly increased risk of **toxic shock syndrome (TSS)**, an occasionally fatal bacterial infection. To reduce the risk of TSS, a woman should wash her hands carefully with soap and water before inserting or removing the diaphragm, should not use the diaphragm during menstruation or when abnormal vaginal discharge is present, and should never leave the device in place for more than 24 hours.

Effectiveness The diaphragm's effectiveness depends mainly on whether it is used properly. In actual practice, women rarely use it correctly every time they have intercourse. With perfect use, the failure rate is about 6%. Typical failure rates are 12% during the first year of use. The main causes of failure are incorrect insertion, inconsistent use, and inaccurate fitting. If a diaphragm slips during intercourse, a woman may choose to use emergency contraception.

Currently diaphragms are rarely used, but they still offer important advantages to some couples.

QUICK STATS

98.9% of American girls age 15–19 report using at least one form of contraceptive during intercourse.

—National Survey of Family Growth, 2011

The Cervical Cap

The **cervical cap**, another barrier device, is a small flexible cup that fits snugly over the cervix and is held in place by suction. This cervical cap is a clear silicone cup with a brim around the dome to hold spermicide and trap sperm, and a removal strap over the dome. It comes in three sizes and must be fitted by a trained clinician. It is used like a diaphragm, with a small amount of spermicide placed in the cup and on the brim before insertion. The cervical cap is reusable but must be replaced annually.

Advantages Advantages of the cervical cap are similar to those associated with diaphragm use. It is an alternative for women who cannot use a diaphragm because of anatomical reasons or recurrent urinary tract infections. The cap fits tightly, so it does not require backup condom use with repeated intercourse. It may be left in place for up to 48 hours.

Disadvantages Along with most of the disadvantages associated with the diaphragm, difficulty with insertion and removal is more common for cervical cap users. Because there may be a slightly increased risk of TSS with prolonged use, the cap should not be left in place for more than 48 hours.

Effectiveness Studies indicate that the average failure rate for the cervical cap is 16% for women who have never had a child and 32% for women who have had a child. Failure rates drop significantly with perfect use.

The Contraceptive Sponge

The **contraceptive sponge** is a round, absorbent device about two inches in diameter with a polyester loop on one side (for removal) and a concave dimple on the other side, which helps it fit snugly over the cervix. The sponge is made of polyurethane and is presaturated with the same spermicide that is used in contraceptive creams and foams. The spermicide is activated when moistened with a small amount of water just before insertion. The sponge, which can be used only once, acts as a barrier, a spermicide, and a seminal fluid absorbent.

Advantages The sponge offers advantages similar to those of the diaphragm and cervical cap. In addition, sponges can be obtained without a prescription or professional fitting, and they may be safely left in place for 24 hours without the addition of spermicide for repeated intercourse. Most women and men find the sponge to be comfortable and unobtrusive during sex.

Disadvantages Reported disadvantages include difficulty with removal and an unpleasant odor if the sponge is left in place for more than 18 hours. Allergic reactions, such as irritation of the vagina, are more common with the sponge than with other spermicide products, probably because the overall dose contained in each sponge is significantly higher than that used with other methods. (A sponge contains 1 gram of spermicide compared with the 60–100 mg present in one application of other spermicidal products.) If irritation of the vaginal lining occurs, the risk of yeast infections and STDs (including HIV) may increase.

Because the sponge has also been associated with toxic shock syndrome, the same precautions must be taken as those described for diaphragm use. A sponge user should be especially alert for symptoms of TSS when the sponge has been difficult to remove or was not removed intact.

Effectiveness The typical effectiveness of the sponge is the same as that of the diaphragm (12% failure rate during the first year of use) for women who have never experienced childbirth. For women who have had a child, however, the failure rate rises to 24%. One possible explanation is that the sponge's size may be insufficient to adequately cover the cervix after childbirth. The user should carefully check the expiration date on each sponge because shelf life is limited.

Vaginal Spermicides

Spermicidal compounds developed for use with a diaphragm have been adapted for use without a diaphragm by combining them with a bulky base. Foams, creams, jellies, suppositories, and films are all available. Spermicides alone are not very effective methods of contraception, so most people use them in combination with a barrier method, such as a condom. Foam is sold in an aerosol bottle or a metal container with an applicator that fits on the nozzle. Creams and jellies are sold in tubes with an applicator that can be screwed onto the opening of the tube (Figure 6.5).

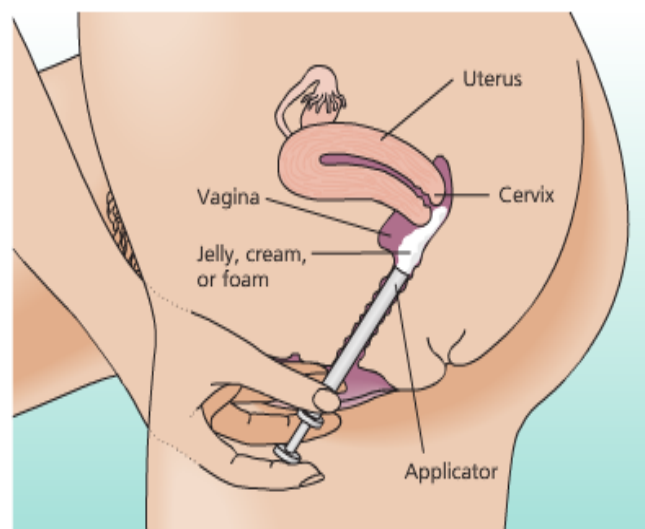


FIGURE 6.5 The application of vaginal spermicide.

Foams, creams, and jellies must be placed deep in the vagina near the cervical entrance and must be inserted no more than 60 minutes before intercourse. After an hour, their effectiveness is drastically reduced, and a new dose must be inserted. Another application is also required before each repeated act of coitus. If the woman wants to **douche**, she should wait for at least six hours after the last intercourse to make sure that there has been time for the spermicide to kill all the sperm; douching is not recommended, however, because it can irritate vaginal tissue and increase the risk of various infections.

The spermicidal suppository is small and easily inserted like a tampon. Because body heat is needed to dissolve and activate the suppository, it is important to wait at least 15 minutes after insertion before having intercourse. The suppository's spermicidal effects are limited in time, and coitus should take place within one hour of insertion. A new suppository is required for every act of intercourse.

The vaginal contraceptive film (VCF) is a paper-thin two-inch square of film that contains spermicide. It is folded over one or two fingers and placed high in the vagina, as close to the cervix as possible. In about 15 minutes the film dissolves into a spermicidal gel that is effective for up to one hour. A new film must be inserted for each act of intercourse.

Advantages The use of vaginal spermicides is relatively simple and can be limited to times of sexual activity. They are readily available in most drugstores and do not require a prescription or a pelvic examination. Spermicides allow complete and immediate reversibility, and the only medical side effects are occasional allergic reactions.

Disadvantages When used alone, vaginal spermicides must be inserted shortly before intercourse, so their use may be seen as an annoying disruption. Some women find the slight increase in vaginal fluids after spermicide use unpleasant. Also, spermicides can alter the balance of bacteria in the vagina. Because this may increase the occurrence of yeast infections and urinary tract infections, women who are especially prone to these infections may want to avoid spermicides. Also, this contraception method does not protect against sexually transmitted diseases such as gonorrhea, chlamydia, or HIV. Overuse of spermicides can irritate vaginal tissues; if this occurs, the risk of HIV transmission may increase.

toxic shock syndrome (TSS) A bacterial disease usually associated with tampon use; symptoms include fever, rash, nausea, headache, dizziness, confusion, fainting, sore throat, cough, and abdominal pain.

TERMS

cervical cap A small flexible cup that fits over the cervix; used with spermicide.

contraceptive sponge A contraceptive device about two inches in diameter that fits over the cervix and acts as a barrier, spermicide, and seminal fluid absorbent.

douche To apply a stream of water or other solution to a body part or cavity such as the vagina; not a contraceptive technique.

Effectiveness The effectiveness rates of vaginal spermicides vary widely, depending partly on how consistently and carefully instructions are followed. The typical failure rate is about 28% during the first year of use. Foam is probably the most effective form of spermicide because its effervescent mass forms a denser and more evenly distributed barrier to the cervical opening. Creams and jellies provide only minimal protection unless used with a diaphragm or cervical cap.

Spermicide is generally recommended only in combination with other barrier methods or as a backup to other contraceptives. Emergency contraceptives provide a better backup than spermicides, however.

Abstinence, Fertility Awareness, and Withdrawal

Millions of people throughout the world do not use any of the contraceptive methods described earlier because of religious convictions, cultural prohibitions, poverty, or lack of information and supplies. If they use any method at all, they are likely to use one of the following relatively “natural” methods of attempting to prevent conception.

Abstinence The decision not to engage in sexual intercourse for a chosen period of time, or **abstinence**, has been practiced throughout history for a variety of reasons. Until relatively recently, many people abstained because they had no other contraceptive measures. Concern about possible contraceptive side effects, STDs, and unwanted pregnancy may be factors. For others, the most important reason for choosing abstinence is a moral one, based on cultural or religious beliefs or strongly held personal values. Many people feel that sexual intercourse is appropriate only for married couples or for people in serious, committed relationships. Abstinence may also be considered the wisest choice in terms of one’s emotional needs. A period of abstinence, for example, may be useful as a time to focus on other aspects of one’s life.

Couples may choose abstinence to allow time for their relationship to grow. A period of abstinence allows partners to get to know each other better and to develop trust and respect for each other. Many couples who choose to abstain from sexual intercourse in the traditional sense turn to other mutually satisfying alternatives. These may include dancing, massage, hugging, kissing, petting, mutual masturbation, and oral-genital sex.

Fertility Awareness–Based Methods Women who practice a **fertility awareness–based method** of contraception abstain from intercourse during the fertile phase of their menstrual cycle. Ordinarily only one egg is released by the ovaries each month, and it lives about 24 hours unless it is fertilized. Sperm deposited in the vagina may be capable of

QUICK STATS

5.4% of women who practice some sort of contraception rely on withdrawal as their birth control method.

—National Survey on Family Growth, 2011

fertilizing an egg for up to six or seven days, so conception can theoretically occur only during six to eight days of any menstrual cycle. However, predicting which eight days is difficult. Recent studies show that even in women who have regular menstrual cycles, it is possible to become pregnant at any time during the menstrual cycle. It is even more difficult to predict the fertile time of the cycle in women who have irregular menses—a situation that is very common, especially in teenagers and women who are approaching menopause. Methods that attempt to predict the fertile times of a woman’s cycle include calendar methods, temperature methods, and methods that rely on observa-

tion of the cyclical changes of the cervical mucus, as well as other characteristics of the cervix. Some women use a combination of methods to determine the time of ovulation.

Calendar methods are based on the idea that the average woman releases an egg 14–16 days before her period begins. To avoid pregnancy, she should abstain from intercourse for about eight days during her cycle, beginning several days before and during the time that ovulation is most likely to occur. However, in one recent study only about 10% of women with regular 28-day cycles actually ovulated 14 days before the next period. The situation is further complicated by the fact that many women have somewhat or very irregular cycles; calendar methods are extremely unreliable for these women.

Temperature methods are based on the knowledge that a woman’s body temperature drops slightly just before ovulation and rises slightly after ovulation. A woman using the temperature method records her basal (resting) body temperature (BBT) every morning before getting out of bed and before eating or drinking anything. Once the temperature pattern is apparent (usually after about three months), the unsafe period for intercourse can be calculated as the interval from day 5 (day 1 is the first day of the period) until three days after the rise in BBT. To arrive at a shorter unsafe period, some women combine the calendar and temperature methods, calculating the first unsafe day from the shortest cycle of the calendar chart and the last unsafe day as the third day after a rise in BBT.

The *mucus method* (or Billings method) is based on changes in the cervical secretions throughout the menstrual cycle. During the estrogenic phase, cervical mucus increases and is clear and slippery. At the time of ovulation, some women can detect a slight change in the texture of the mucus and find that it is more likely to form an elastic thread when stretched between thumb and finger. After ovulation, these secretions

abstinence Avoidance of sexual intercourse; a method of contraception.

fertility awareness–based method A method of preventing conception based on avoiding intercourse during the fertile phase of a woman’s cycle.

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Table 6.3**Contraceptive Methods and STD Protection**

METHOD	LEVEL OF PROTECTION
Hormonal methods	Do not protect against HIV or STDs in lower reproductive tract; may increase risk of cervical chlamydia; provide some protection against PID.
IUD	Does not protect against STDs; mildly associated with PID in first month after insertion.
Latex, polyisoprene, or polyurethane male condom	Best method for protection against STDs (if used correctly); does not protect against infections from lesions that are not covered by the condom. (Lambskin condoms do not protect against STDs.)
Female condom	Reduction of STD risk similar to that of male condom; may provide extra protection for external genitalia.
Diaphragm, sponge, or cervical cap	Provides some protection against cervical infections and PID. Diaphragms, sponges, and cervical caps should not be relied on for protection against HIV.
Spermicide	Modestly reduces the risk of some vaginal and cervical STDs; does not reduce the risk of HIV, chlamydia, or gonorrhea. If vaginal irritation occurs, infection risk may increase.
Fertility awareness–based methods	Do not protect against STDs.
Sterilization	Does not protect against STDs.
Abstinence	Complete protection against STDs (as long as all activities that involve the exchange of body fluids are avoided).

become cloudy and sticky and decrease in quantity. Infertile, safe days are likely to occur during the relatively dry days just before and after menstruation. These additional clues have been found to be helpful by some couples who rely on fertility awareness–based methods. One problem that may interfere with this method is that vaginal infections, vaginal products, or medication can also alter the cervical mucus.

Fertility awareness–based methods are not recommended for women who have very irregular cycles—about 15% of all menstruating women. Any woman for whom pregnancy would be a serious problem should not rely on these methods alone because the failure rate is high—approximately 25% during the first year of use. Further, fertility awareness–based methods offer no protection against STDs. Some women use fertility awareness in combination with a barrier method to reduce their risk for unwanted pregnancy. Fertility awareness methods are recommended by the Catholic church because the church does not approve of other forms of contraception.

Withdrawal In **withdrawal**, or *coitus interruptus*, the male removes his penis from the vagina just before he ejaculates. Withdrawal has a high failure rate because the male has to overcome a powerful biological urge. Further, because preejaculatory fluid may contain viable sperm, pregnancy can occur even if the man withdraws prior to ejaculation. Sexual pleasure is often affected because the man must remain in control and the sexual experience of both partners is interrupted.

The failure rate for typical use is about 22% in the first year. Men who are less experienced with sexual intercourse and withdrawal or who have difficulty in foretelling when ejaculation will occur have higher failure rates. Withdrawal does not protect against STDs.

Combining Methods

Couples can choose to combine the preceding methods in a variety of ways, both to add STD protection and to increase contraceptive effectiveness. For example, condoms are

strongly recommended along with OCs and other forms of hormonal contraception whenever there is a risk of STDs (Table 6.3). For many couples, and especially for women, the added benefits far outweigh the extra effort and expense of using multiple methods. Table 6.4 summarizes the effectiveness of available contraceptive methods.

EMERGENCY CONTRACEPTION

Emergency contraception (EC) refers to postcoital methods—those used after unprotected sexual intercourse. An emergency contraceptive may be appropriate if a regularly used method has failed (for example, if a condom breaks) or if unprotected sex has occurred. Sometimes called the “morning-after pill,” emergency contraceptives are designed only for emergency use and should not be relied on as a regular birth control method; other methods of birth control are more effective.

When emergency contraceptives were first approved by the FDA, opponents feared that they might act as an **abortifacient**—preventing implantation of a fertilized egg, theoretically causing abortion. However, recent evidence indicates that emergency contraceptives do not interrupt an established pregnancy. Postcoital pills work primarily by inhibiting or delaying ovulation and by altering the transport of sperm and eggs; they do not affect a fertilized egg already implanted in the uterus and thus do not cause abortion.

withdrawal A method of contraception in which the man withdraws his penis from the vagina prior to ejaculation; also called *coitus interruptus*.

emergency contraception (EC) A birth control method used after unprotected sexual intercourse has occurred.

abortifacient An agent or substance that induces abortion.

TERMS

Table 6.4

Contraceptives: From Most Effective to Least (Percentage of Women Experiencing Unintended Pregnancy within the First Year of Use)

METHOD	TYPICAL USE	PERFECT USE
REVERSIBLE METHODS		
<i>Extremely effective:</i>		
Complete abstinence		0.0%
Implant (Implanon)	0.05%	0.05%
Mirena IUD	0.2%	0.2%
ParaGard IUD	0.8%	0.6%
Injectable (3-month)	6.0%	0.2%
<i>Very effective:</i>		
Pill	9.0%	0.3%
Patch	9.0%	0.3%
Ring	9.0%	0.3%
<i>Moderately effective:</i>		
Male condom	18.0%	2.0%
Diaphragm	12.0%	6.0%
Sponge (if never had a child)	12.0%	9.0%
Cervical cap (if never had a child)	16.0%	9.0%
Female condom	21.0%	5.0%
<i>Less effective:</i>		
Periodic abstinence	24.0%	
Withdrawal	22.0%	4.0%
Spermicides	28.0%	18.0%
Sponge (if have had a child)	24.0%	20.0%
Cervical cap (if have had a child)	32.0%	26.0%
PERMANENT METHODS		
Vasectomy	0.15%	0.1%
Essure	0.2%	0.2%
Tubal sterilization	0.5%	0.5%
No method	85.0%	85.0%

SOURCE: Trussell, J. "Contraceptive Efficacy." In Hatcher, R. A., J. Trussell, A. L. Nelson, W. Cates, F. H. Stewart, and D. Kowal. *Contraceptive Technology*, 20th Revised Edition. Copyright © 2011 Ardent Media. Reprinted with permission.

Until recently, the most frequently used emergency contraceptive was a two-dose regimen of oral contraceptives. Newer products—Plan B, Plan B One-Step, and Next Choice—are now in common use and are more effective, with fewer side effects, than older methods of EC. Plan B One-Step, which replaced Plan B in 2009, contains a single progestin-only pill, whereas Next Choice has two pills that are taken 12 hours apart. The pills should be taken as soon as possible after inadequately protected sex. If taken within 24 hours after intercourse, emergency contraceptives may prevent as many as 95% of expected pregnancies. Overall they reduce pregnancy risk by about 89%. They are most effective if initiated in the first 12 hours, but they can be taken up to 120 hours after

unprotected intercourse. Possible side effects include nausea, stomach pain, headache, dizziness, and breast tenderness. If a woman is already pregnant, these pills will not interfere with the pregnancy. Current emergency contraceptives are considered very safe.

Plan B One-Step and Next Choice are available as over-the-counter (OTC) drugs (no prescription required) for women and men ages 17 and older. They remain prescription drugs for those under age 17. To buy an emergency contraceptive, you need to ask for it at the pharmacy counter and show proof of age. It is recommended that you call ahead to make sure your pharmacy has EC on hand. The vast majority of pharmacies, especially the larger chains, currently carry emergency contraceptives.

Some clinicians advise women to keep a package of emergency contraceptives on hand in case their regular contraception method fails or they have unprotected intercourse. Research has found that ready access to emergency contraception improves the rate of use as well as decreasing the time to use. However, it does not lead to an increase in unprotected intercourse or STDs.

Theoretically, rates of unplanned pregnancy and abortion should drop when women have emergency contraception readily available. However, a recent study of women who were given EC in advance to keep at home and use as needed did not show a decrease in unintended pregnancies. These women had EC at hand, but many failed to use it. Some women may have feared side effects, particularly nausea and vomiting, but current emergency contraceptives contain progestin only and so do not cause as much nausea as older versions of EC. Three-quarters of women taking these newer ECs do not experience nausea; vomiting occurs in less than 10% of women who take them.

Another reason why women fail to take emergency contraceptives even when they have them may be that they underestimate their risk of pregnancy. Many women still believe that they can't get pregnant from a single act of intercourse. Expense is also an issue for some women. EC is covered by some health plans as well as by Medicaid in many states. However, many women must pay directly for EC, which costs about \$50.

To find out more about emergency contraception and how to obtain it in your area, visit the Emergency Contraception website at <http://ec.princeton.edu>. Planned Parenthood is a good source of information, as are most pharmacies. Plan B One-Step has a website (<http://www.planbonestep.com>) that, as of this printing, contains a card you can print and

hand to the pharmacist as an easy way to request EC. Next Step, which is slightly less expensive than Plan B One-Step, also has a website (<http://www.mynextchoice.com>) where you can locate pharmacies in your area that carry the product. You can also call the Emergency Contraception Hotline (888-NOT-2-LATE) for more information about access.

Intrauterine devices can also be used for emergency contraception. If inserted within five days of unprotected intercourse,

Emergency contraceptives do not result in an abortion and do not interfere with an existing pregnancy.



In some states, pharmacists are required to fill prescriptions for emergency contraception, even if they have personal objections to it. In other states, they are allowed to refuse to fill such prescriptions.

the Copper T ParaGard IUD (discussed earlier) is even more effective than pills for emergency contraception. It has the added benefit of providing up to 10 years of contraception.

A new emergency contraceptive, ulipristal acetate, was approved for use by the Food and Drug Administration in 2010. Sold under the name ella, this drug is effective if taken up to five days after unprotected intercourse. The medication is a progesterone agonist/antagonist that acts to delay and inhibit ovulation. Just as with Plan B and Next Choice, ella is not an abortifacient, and therefore will not interfere with an implanted pregnancy. At the time of this writing, ella is available by prescription only.

PERMANENT CONTRACEPTION

Sterilization is permanent, and it is highly effective at preventing pregnancy. For these reasons, it is becoming an increasingly popular method of contraception. At present it is tied with the pill as the most commonly used contraceptive method in the United States and is by far the most common method used worldwide. It is especially popular among couples who have been married 10 or more years and have had all

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

If you are sexually active, do you use any of the reversible methods described in the preceding sections? Based on the information given here, do you believe you are using your contraceptive perfectly, or in a way that increases your risk of an unintended pregnancy?

the children they intend to have. Sterilization does not protect against STDs.

An important consideration in choosing sterilization is that, in most cases, it cannot be reversed. Although the chances of restoring fertility are being increased by modern surgical techniques, such operations are costly, and pregnancy can never be guaranteed. Some couples choosing male sterilization store sperm to extend the option of childbearing.

Many studies indicate that male sterilization is preferable to female sterilization for a variety of reasons. The overall cost of a female procedure is about four times that of a male procedure, and women are much more likely than men to experience complications following the operation. Further, feelings of regret seem to be more prevalent in women than in men after sterilization. Men seeking sterilization are typically white, married, relatively affluent, well educated, and privately insured.

Although some physicians will perform surgery for sterilization on request, most require a thorough discussion with both partners before the operation. Most physicians also recommend that people who have religious conflicts, psychological problems related to sex, or unstable marriages not be sterilized. Young couples who might later change their minds are also frequently advised not to undergo sterilization.

Male Sterilization: Vasectomy

The procedure for male sterilization, **vasectomy**, involves severing the vasa deferentia, two tiny ducts that transport sperm from the testes to the seminal vesicles. The testes continue to produce sperm, but the sperm are absorbed into the body. Because the testes contribute only about 10% of the total seminal fluid, the actual quantity of ejaculate is only slightly reduced. Hormone production from the testes continues with very little change, and secondary sex characteristics are not altered.

Vasectomy is ordinarily performed in a physician's office and takes about 30 minutes. A local anesthetic is injected into the skin of the scrotum near the vasa. Small incisions are made at the

sterilization Surgically altering the reproductive system to prevent pregnancy. Vasectomy is the procedure in males; tubal sterilization or hysterectomy is the procedure in females.

vasectomy The surgical severing of the ducts that carry sperm to the ejaculatory duct.

TERMS

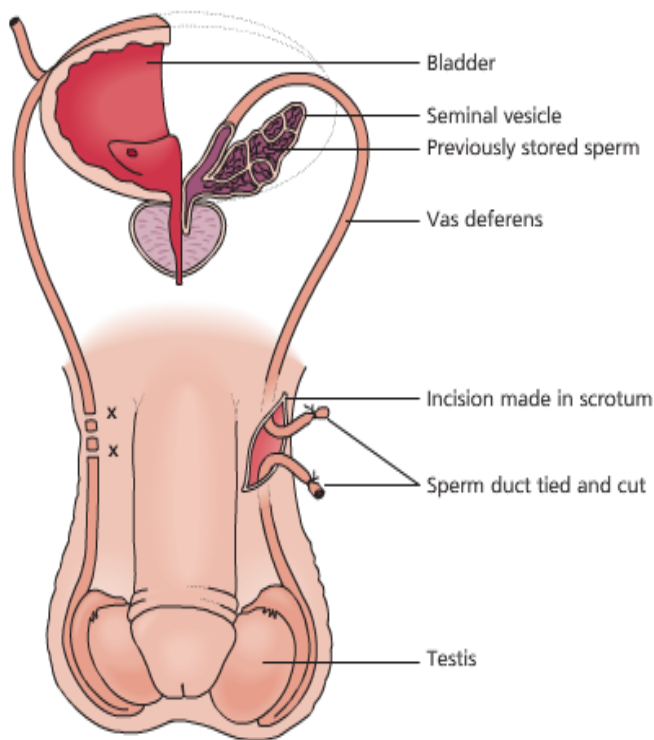


FIGURE 6.6 Vasectomy. This surgical procedure involves severing the vasa deferentia, thereby preventing sperm from being transported and ejaculated.

upper end of the scrotum where it joins the body, and the vas deferens on each side is exposed, severed, and tied off or sealed by electrocautery. Some doctors seal each of the vasa with a plastic clamp, which is the size of a grain of rice. The incisions are then closed with sutures, and a small dressing is applied (Figure 6.6). Pain and swelling are usually slight and can be relieved with ice compresses and a scrotal support. Bleeding and infection occasionally develop but are usually easily treated. Fewer complications occur with an alternative procedure involving a midline puncture rather than incisions; many physicians in the United States now perform this “no-scalpel” vasectomy. After either procedure, most men can return to work in two days.

Men can have sex after vasectomy as soon as they feel no discomfort, usually after about a week. Another method of contraception must be used for at least three months after vasectomy, however, because sperm produced before the operation may still be present in the semen. Microscopic examination of a semen sample, called *semen analysis*, is required to confirm that sperm are no longer present in the ejaculate. Recommendations for semen analysis after vasectomy vary. Most doctors recommend having the first semen analysis about three months after surgery, and a second test to confirm the results a few weeks later. Some doctors recommend having another test in a year. Studies show that most men fail to complete follow-up testing after vasectomy. Fortunately, unintended pregnancies following vasectomy are rare, even when follow-up procedures are ignored.

Vasectomy is highly effective. In a small number of cases, a severed vas rejoins itself, so some physicians advise yearly examination of a semen sample. The overall failure rate for

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your personal views on sterilization? Do you think it could be an option for you one day? Do you believe people should forgo considering sterilization until they have reached a certain point in their lives? If so, what is that point? When does sterilization become the best option, if ever?

vasectomy is 0.15%. No strong links have been found between vasectomy and chronic diseases, and the bulk of the evidence now indicates that men with vasectomies are not at increased risk for heart disease, prostate cancer, or testicular cancer. Vasectomy costs \$400 to \$1000 in the United States and is covered by Medicaid in most states, and by many private insurance companies.

About one-half of vasectomy reversals are successful, though this rate can vary significantly depending on the number of years since the initial surgery. In at least half of all men who have had vasectomies, the process of absorbing sperm (instead of ejaculating it) results in antisperm antibodies that may interfere with later fertility. Vasectomy reversal costs between \$5000 and \$15,000 in the United States.

Female Sterilization

The most common method of female sterilization involves severing or blocking the oviducts, thereby preventing eggs from reaching the uterus and sperm from entering the fallopian tubes. Ovulation and menstruation continue, but the unfertilized eggs are released into the abdominal cavity and absorbed. Although progesterone levels in the blood may decline slightly, hormone production by the ovaries and secondary sex characteristics are generally not affected.

Tubal sterilization (also called *tubal ligation*) is most commonly performed by a method called **laparoscopy**. A laparoscope, a camera containing a small light, is inserted through a small abdominal incision, and the surgeon looks through it to locate the fallopian tubes. Instruments are passed either through the laparoscope or through a second small incision, and the two fallopian tubes are sealed off with ties or staples or by electrocautery (Figure 6.7). General anesthesia is usually used. The operation takes about 30 minutes, and women can usually leave the hospital two to four hours after surgery. Tubal sterilization can also be performed shortly after a vaginal delivery, or in the case of cesarean section, immediately after the uterine incision is repaired.

tubal sterilization Severing or blocking the oviducts to prevent eggs from reaching the uterus; also called *tubal ligation*.

laparoscopy Examining the internal organs by inserting a small camera through an abdominal incision.

TERMS

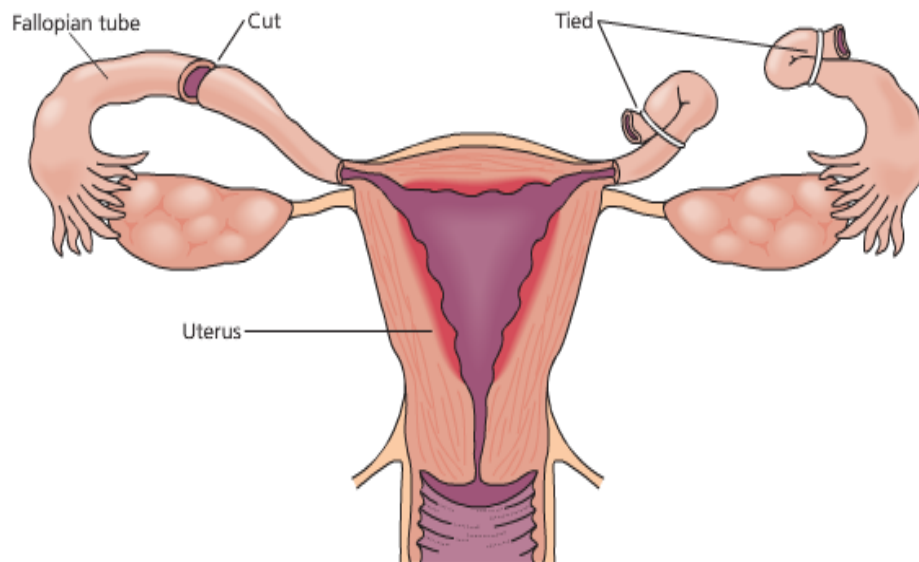


FIGURE 6.7 Tubal sterilization.

This procedure involves severing or blocking the fallopian tubes, thereby preventing eggs from traveling from the ovaries to the uterus. It is a more complex procedure than vasectomy.

Although tubal sterilization is somewhat riskier than vasectomy, with a rate of minor complications of about 6–11%, it is the more common procedure (see the box “Contraceptive Use among American Women”). Potential problems include bowel injury, wound infection, and bleeding. Serious complications are rare, and the death rate is low.

The failure rate for tubal sterilization is about 0.5%. When pregnancies occur, an increased percentage of them are ectopic (occurring outside the uterus). Ectopic pregnancy is dangerous and can even cause death, so any woman who suspects she might be pregnant after having tubal sterilization should seek medical help. Because successful reversal rates are low and the procedure is costly, female sterilization should be considered permanent.

Two new forms of incision-free female sterilization have recently become available. Each of these procedures can be performed with local anesthetic in a doctor’s office, and both have short recovery times. The first, called the Essure System, consists of tiny springlike metallic implants that are inserted through the vagina and into the fallopian tubes, using a special catheter. Within several months, scar tissue forms over the implants, blocking the tubes. A backup method must be used until a test shows that the tubes are occluded. Placement of the device doesn’t require an incision or general anesthesia, and recovery time is quicker than that following tubal sterilization. Only clinicians with specialized training and equipment can perform this procedure.

In 2009 the FDA approved a second, somewhat similar, method for blocking a woman’s fallopian tubes without an incision. The procedure, marketed under the name Adiana, involves using low-frequency waves to create small lesions just inside the entrance to each fallopian tube. A small silicone insert, the size of a grain of rice, is then placed in each tube. As the lesions heal, healthy new tissue grows on and around the device, eventually blocking the fallopian tube. Adiana’s three-year failure rate is about 1.8%.

Hysterectomy, removal of the uterus, is the preferred method of sterilization for only a small number of women, usually those with preexisting menstrual or other uterine problems. Because of the risks involved, hysterectomy is not recommended as a form of contraception unless the woman has disease or damage of the uterus and future surgery appears inevitable.

ISSUES IN CONTRACEPTION

The subject of contraception is closely tied to several issues that receive a lot of attention in the United States, such as premarital sexual relations, gender differences, and sexuality education for teens.

When Is It OK to Begin Having Sexual Relations?

Answers to this question strongly affect a society’s approach to contraception. Opinions on the appropriate age or time to begin having sex often determine one’s views on sexuality education and contraception accessibility. Americans have a wide range of opinions on this issue: only after marriage; when 18 years or older; when in a loving, stable relationship; when the partners have completed their education and/or could support a child; whenever both partners feel ready and are using protection against pregnancy and STDs.

Opinions about appropriate sexual behavior shift from one decade to another. Although attitudes became more liberal during the 1960s and 1970s, people started having more

QUICK STATS

14% of U.S. high school students have had sex with four or more partners.

—CDC, 2011

hysterectomy Total or partial surgical removal of the uterus.

TERMS



DIVERSITY MATTERS

Contraceptive Use among American Women

Nearly all American women use contraceptives at some time during their lives. According to the National Center for Health Statistics, 99% of all U.S. women who have ever had intercourse have used a contraceptive.

About 62 million women in the United States are in their childbearing years (15–44) and thus face decisions about contraception. About 62% of these women currently use some form of contraception. Most of the remaining 38% are sterile, pregnant, trying to become pregnant, or not sexually active.

Only about 7% of American women are fertile, sexually active, not seeking pregnancy, and not using contraceptives. This small group accounts for almost half of the 3 million unintended pregnancies that occur each year. The unintended pregnancies that occur among contraceptive users are usually the result of inconsistent or incorrect use of methods. For example, one-third of barrier method users report not using their method every time they have intercourse.

Oral contraceptives and female sterilization are the two most popular methods among American women (see the accompanying table). However, choice of contraceptive method and consistency of use vary with age, marital status, and other factors:

- **Age:** Sterilization is much more common among older women, particularly those who are over 35 years of age and/or who have had children. Young women in their teens and twenties are more likely to use the pill or condoms. Older women, however, are more likely to use reversible methods consistently. They are less likely to miss pills and more likely to use barrier methods during every act of intercourse.
- **Marital status:** Women who are or were married have much higher rates of sterilization than women who have never been married. Those who have never been married have high rates of OC and condom usage.

- **Ethnicity:** Overall rates of contraceptive use and use of OCs are highest among white women. Female sterilization, implants, and injectable contraceptives are more often used by African American women and Latinas, and IUD use is highest among Latinas. Condom use is highest among Asian American women and is similar across other ethnic groups. Male sterilization is much more common among white men than among men of other ethnic groups.

- **Socioeconomic status and educational attainment:** Low socioeconomic status and low educational attainment are associated with high rates of female sterilization and low rates of pill and condom use. However, women who are poor or have low educational attainment and who use OCs have higher rates of consistent use than women who are wealthier or have more education. About 20% of women ages 15–44 lack adequate health insurance, increasing the cost and difficulty of obtaining contraceptives.

- **New trends:** About 10% of American women have used emergency contraception at least once, up from 4% in 2002. The percentage of women who have ever used the patch rose from 1% to 10% in the last six years. Rates of IUD use, especially among women who have already had at least one child, have also risen dramatically.

Some trends in contraceptive use may also reflect the differing priorities and experiences of women and men. For example, female sterilization is more expensive and carries greater health risks than male sterilization—yet it is more than twice as common. (Worldwide, female sterilization is more than four times as common as male sterilization.) This pattern may reflect culturally defined gender roles and the fact that women are more directly affected by unintended pregnancy. In surveys, women rate pregnancy prevention as the single most important factor when choosing a contraceptive method; in contrast, men rate STD prevention as equally important.

Method	Percentage of Users
Pill	28.0
Tubal sterilization	27.1
Male condom	16.1
Vasectomy	9.9
IUD	5.5
Withdrawal	5.2
Three-month injectable (Depo-Provera)	3.2
Vaginal ring (Nuva-Ring)	2.4
Implant (Implanon), one month injectable (Lunelle), or patch (Ortho Evra)	1.1
Periodic abstinence (calendar method)	0.9
Other* (includes emergency contraception, sponge, cap, female condom)	0.4

SOURCES: Frost, L. J., et al. 2007. Factors associated with contraceptive use and nonuse, United States, 2004. *Perspectives on Sexual and Reproductive Health* 39(2): 90–99; Guttmacher Institute. 2010. *Facts In Brief: Facts on Contraceptive Use*

(http://www.guttmacher.org/pubs/fb_contr_use.html); Mosher, W. D., and J. Jones. 2010. Use of contraception in the U.S.: 1982–2008. National Center for Health Statistics. *Vital Health Statistics* 23(29).

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restrictive views in the 1980s and 1990s. Today the most common reasons for disapproving of sex are the risk of exposure to STDs, the risk of pregnancy, and moral or religious beliefs. According to recent data, most of today's young Americans are somewhat permissive regarding premarital sex. Although many approve of sexual relations for couples who are seriously dating or engaged to be married, they are less accepting of sexual intercourse on a first date or at the casual dating stage. However, "hooking up" (having intimate physical contact without a committed emotional relationship) is currently common on some high school and college campuses (see Chapter 4).

As the average age of first marriage increases (currently age 26 for women and 28 for men), young people typically experience a decade or more between puberty and marriage, making sex outside of marriage and sex with multiple partners more likely. As a result, decisions about sexual activity, contraception, and STD prevention become even more important for young people. Unfortunately, however, many individuals in this age group—even those who protect their health in all other areas of their life—end up taking high risks in their sexual behavior. Ambivalence and a lack of communication about who will "take charge" are common. (For guidelines on improving your own

communication, see the box "Talking with a Partner about Contraception.") Alcohol and drug use are also strongly linked to risky sexual behavior in multiple studies.

Contraception and Gender Differences

The consequences of not using contraception are markedly different for men and women. In past years, women have accepted the primary responsibility for contraception, along with related side effects and health risks, partly because of the wider spectrum of methods available to them and partly because women have greater personal investment in preventing pregnancy and childbearing. Men still have very few contraceptive options, with condoms being the only reversible method currently available. Recently, however, men's participation has become critical because condom use is central to the prevention of STD transmission even when OCs or other methods are being used by women for contraception.

Although dependent primarily on the cooperation of the man, condom use and the prevention of STDs have potentially greater consequences for the woman. Whereas men may suffer only local and short-term effects from the most common diseases (not including HIV infection), women face an increased risk of serious long-term effects, such as cervical cancer and/or pelvic infection with associated infertility, from these same prevalent STDs. In addition, women are more likely than men to contract HIV from an infected partner. In other words, although dependent on the male, condom use is clearly a more important issue for women. The female condom may offer a helpful alternative, but the male partner still needs to cooperate to ensure its correct use.

While women often must deal with greater consequences associated with inadequate contraceptive use, health care professionals are increasingly seeing the importance of involving male partners in the selection and use of contraceptives. Multiple methods have been identified to encourage shared responsibility, including expanding educational material and clinical programs that focus on the male's role in contraception; encouraging males to share in the responsibility of using contraception, such as making sure pills are taken daily and the patch is changed at the appropriate time; and encouraging males to buy and use condoms whenever appropriate, and also share the costs associated with additional contraceptives used.

Scientists have attempted to develop a hormonal contraceptive for males for many years. Though progress has been made in identifying hormonal alterations that inhibit sperm formation, no treatment has been identified that suppresses this process entirely and still has a favorable side effect profile. Research has also focused on vas deferentia implants to block the passage of sperm out of the testicle, but this remains in the experimental stages.

Worldwide, condom use is increasing, but it remains low in developing countries, where it is often difficult for women to negotiate safer sex and condom use. The World Health Organization reports that the main factor in poor sexual health around the world is gender inequality.



How old should people be when they become sexually active? The answer depends on the personal values, beliefs, and experiences of the individuals involved.



TAKE CHARGE

Talking with a Partner about Contraception

Many people have a difficult time talking about contraception with a potential sex partner. How should you bring it up? And whose responsibility is it? Talking about the subject may be embarrassing at first, but imagine the possible consequences of not talking about it. An unintended pregnancy or a sexually transmitted disease could profoundly affect you for the rest of your life. Talking about contraception is one way of showing that you care about yourself, your partner, and your future.

Before you talk with your partner, explore your own thoughts and feelings. Find out the facts about different methods of contraception, and decide which one you think would be most appropriate for you. If you're nervous about having this discussion with your partner, it may help to practice with a friend.

Pick a good time to bring up the subject. It makes sense to have this discussion before you start having sex, but even if you've already had intercourse with your partner, it's important to be on the same page about contraception. A time when you're both feeling comfortable and relaxed will improve your chances of having a good discussion. Tell your partner what you know about contraception and how you feel about using it, and talk

about what steps you both need to take to get and use a method you can live with. Listen to what your partner has to say, and try to understand his or her point of view. You may need to have more than one discussion, and it may take some time for both of you to feel comfortable with the subject. But don't have sex until this issue is resolved.

If you want your partner to be involved but he or she isn't interested in talking about contraception, or if he or she leaves all the responsibility for it up to you, consider whether this is really a person you want to be sexually involved with. If you decide to go ahead with the involvement, you may want to enlist the support of a friend, family member, or health care provider to help you make and implement decisions about contraception.

If you have been involved in hooking up with people you don't know well and are not having an ongoing relationship with, discussions about contraception may seem unrealistic. At a minimum, refuse to have sex with anyone who won't use a condom. If you are a woman, purchase emergency contraception ahead of time, and don't hesitate to use it. Both men and women should carefully consider the risks involved in hooking up. Remember that no contraceptive method can completely protect you from the potential consequences of being intimate with a person you do not know well.

The experience of an unintended pregnancy is also very different for men and women. Although men suffer emotional stress from such an unexpected occurrence (and sometimes share financial and/or custodial responsibilities), women are much more intimately affected, obviously by the biological process of pregnancy itself as well as the outcome: abortion, adoption, or parenting. In addition, our societal attitudes are more severely punitive toward the woman and place much greater responsibility and blame on her when an unintended pregnancy occurs. Fortunately, there is growing interest in the roles and responsibilities of men in family planning.

Sexuality and Contraception Education for Teenagers

Sexuality education and pregnancy prevention programs for teenagers are an important, though controversial, issue. Opinion in the United States is sharply divided on this subject. Certain groups are concerned that more sexuality education and especially the availability of contraceptives will lead to more sexual activity and promiscuity. They maintain that greater access to improved contraception was a key factor contributing to the sexual revolution in the 1960s and that the ensuing liberal sexual attitudes have been generally more destructive than helpful. They point to an increase in divorce, a rise in STDs, and a general relaxing of standards of morality as related negative effects.



Contraception and safe sex practices are a joint responsibility for any sexually active couple. The health care community is taking steps to educate young men on their role in avoiding pregnancies and STDs.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you feel your sexual education up to this point in your life has been complete? Do you feel it has prepared you to have a healthy, safe, and responsible sexual life?

Many in this group urge that sexuality education be handled in the home, where parents can instill moral values, including premarital abstinence. According to some in this group, young people should primarily be taught to “just say no.” As a result of these opinions, many school districts have adopted the policy of teaching only about the value of abstinence in their sex education classes (“abstinence-only”) rather than providing more comprehensive information about contraceptive use and STD prevention.

Other groups argue that sex education for teens needs to address the reality that many teens are sexually active despite programs that encourage abstinence. These groups argue that teens need to know how to prevent pregnancy and avoid contracting sexually transmitted diseases. They further assert that many parents are not effectively dealing with the issues and that a broader, coordinated approach involving public institutions, including schools, is needed in addition to parental input. Many current programs focus on postponing sexual involvement but also emphasize contraceptive use for individuals who are sexually active. Increased availability of contraceptive information and methods is considered a necessary and realistic part of this more comprehensive approach.

Sexuality and contraceptive education remains a volatile issue. The vast majority of research on teen sexual behavior shows that sexually active students who receive comprehensive sexuality education (where both abstinence and contraceptive use are taught) are more likely to use contraceptives. Moreover, research also shows that teens who were not yet sexually active do not start having sex sooner as a result of attending comprehensive sex education programs. Conversely, most studies show that abstinence-only school programs do not appear to reduce the number of teens who are having sex, and they also lead to decreased rates of contraception use. Although a great deal of focus has been placed on HIV and STD prevention, the nearly half a million U.S. teenage pregnancies that occur each year are a serious public health problem and warrant much greater national attention. The federal government has identified the issue of teen pregnancy as an urgent issue, and therefore is providing funding to programs that provide factual information about STDs and pregnancy prevention while also addressing issues of sexuality and abstinence. The American Academy of Pediatrics also supports the provision of factual, comprehensive sexual education in all schools as part of a standard curriculum.

WHICH CONTRACEPTIVE METHOD IS RIGHT FOR YOU?

The process of choosing and using a contraceptive method can be complex and varies from one couple to another. Each person must consider many variables in deciding which method is most acceptable and appropriate for her or him. Key considerations include those listed here:

1. **Health risks.** When considering any contraceptive method, determine whether it may pose a risk to your health. For example, hormonal methods should be used only after a clinical evaluation of your medical history. Other methods have only minor and local side effects. Talk with your health care provider about the potential health effects of different methods for you. Remember that pregnancy and abortion carry significant health risks that are generally much greater than the risks of any method of contraception.
2. **The implications of an unplanned pregnancy.** Many teens and young adults fail to consider how their lives would be affected by an unexpected pregnancy. When considering contraception (or deciding whether to have sex at all), think about the potential consequences of your choices. People who choose to be sexually active but would be negatively impacted by an unplanned pregnancy need to use an effective means of birth control and use it consistently.
3. **STD risk.** STDs are another potential consequence of sex. In fact, several activities besides vaginal intercourse (such as oral and anal sex) can put you at risk for an STD. Condom use is of critical importance whenever any risk of STDs is present, even if you are using another contraceptive method to prevent pregnancy. This is especially true whenever you are not in an exclusive, long-term relationship. Abstinence or activities that don't involve intercourse or any other exchange of body fluids can be a satisfactory alternative for some people. Also, consider trying the female condom; although you may be less familiar with it, the female condom has several advantages over male condoms and may be even more effective in STD prevention.
4. **Convenience and comfort level.** The hormonal methods are generally ranked high in this category for most women. If forgetting to take pills is a problem for you, a vaginal ring, contraceptive patch, implant, or injectable method may be a good alternative to the pill. For those who choose a barrier method, the diaphragm, cervical cap, contraceptive sponge, female condom, and spermicides can be inserted before intercourse begins, unlike condoms, which must be put on the erect penis. Some people think condom use disrupts spontaneity, but creative approaches to condom use can decrease these concerns.
5. **Type of relationship.** Barrier methods require more motivation and sense of responsibility from *each* partner



ASSESS YOURSELF

Which Contraceptive Method Is Right for You and Your Partner?

If you are sexually active, you need to use the contraceptive method that works best for you. The following questions will help you sort out factors that affect your choice and pick an appropriate contraceptive method. Answer yes or no for each statement.

- _____ 1. I like sexual spontaneity and don't want to be bothered with contraception at the time of sexual intercourse.
- _____ 2. I need a contraceptive immediately.
- _____ 3. It is very important that I do not become pregnant now.
- _____ 4. I want a contraceptive method that will protect me and my partner against sexually transmitted diseases.
- _____ 5. I prefer a contraceptive method that requires the cooperation and involvement of both partners.
- _____ 6. I have sexual intercourse frequently.
- _____ 7. I have sexual intercourse infrequently.
- _____ 8. I am forgetful or have a variable daily routine.
- _____ 9. I have more than one sex partner.
- _____ 10. I have heavy periods with cramps.
- _____ 11. I prefer a method that requires little or no action or bother on my part.
- _____ 12. I am a nursing mother.*
- _____ 13. I want the option of conceiving immediately after discontinuing contraception.
- _____ 14. I want a contraceptive method with few or no side effects.
- _____ 15. I want a very effective contraceptive method that requires no work on my part for at least three years.

If you answered yes to these statements:

1, 3, 6, 10, 11, 12
1, 3, 6, 8, 10, 11
1, 3, 6, 8, 10, 11, 12
1, 3, 6, 8, 11, 12, 15
1, 3, 6, 8, 10, 11, 12, 13, 15
1, 3, 6, 8, 11, 12, 13, 15
2, 4, 5, 7, 8, 9, 12, 13, 14
2, 5, 7, 8, 12, 13, 14
5, 7, 8, 12, 13, 14

These contraceptive methods may be a good choice for you:

Oral contraceptives
Contraceptive patch, vaginal ring
Injectable contraceptive (Depo-Provera)
Contraceptive implant (Implanon)
IUD (Mirena)
IUD (ParaGard)
Condoms (male and female)
Vaginal spermicides and sponge
Diaphragm and spermicide, cervical cap

*Progestin-only hormonal contraceptives (the minipill and Depo-Provera injections) are safe for use by nursing mothers; contraceptives that include estrogen are not usually recommended.

than hormonal methods do. When the method depends on the cooperation of one's partner, assertiveness is necessary, no matter how difficult. This is especially true in new relationships, when condom use is most important. When sexual activity is infrequent, a barrier method may make more sense than an IUD or one of the hormonal methods.

6. **Ease and cost of obtaining and maintaining each method.** Investigate the costs of different methods. If you have insurance, find out if it covers any of the costs. Remember that your student health clinic probably provides family planning services, and most communities have low-cost family planning clinics, such as Planned Parenthood.

7. **Religious or philosophical beliefs.** For some people, abstinence and/or fertility awareness-based methods may be the only permissible contraceptive methods.
8. **Potential noncontraceptive benefits.** Women with dysmenorrhea, irregular periods, acne, endometriosis, severe PMS, and other medical problems may benefit from using a particular method of contraception. Be sure to discuss these issues with your health care provider so that you can take advantage of the noncontraceptive benefits associated with many methods of birth control.

Whatever your needs, circumstances, or beliefs, *do* make a choice about contraception. Not choosing anything is the one method known *not* to work. (To help make a choice that's right

for you, take the quiz in the box “Which Contraceptive Method Is Right for You and Your Partner?”) This is an area in which taking charge of your health has immediate and profound implications for your future. The method you choose today won’t necessarily be the one you’ll want to use your whole life or even next year. But it should be one that works for you right now.

TIPS FOR TODAY AND THE FUTURE

Your decisions about contraception are among the most important you will make in your life.

RIGHT NOW YOU CAN:

- If you’re sexually active, consider whether you are confident that you’re doing everything possible to prevent an unwanted pregnancy.
- If you’re sexually active, discuss your contraceptive method with your partner. Make sure you are using the method that works best for you.
- Work with your partner to choose a backup contraceptive method to use in case your primary method isn’t effective enough. Consider keeping an emergency contraceptive on hand in case of a slip-up.

IN THE FUTURE YOU CAN:

- Talk to your physician about contraception and get his or her advice on choosing the best method.
- Occasionally discuss your contraceptive method with your partner to make sure it continues to meet your needs. A change in health status or lifestyle may make a different form of contraception preferable in the future.

connect™

Connect to Your Choices

Have you ever thought about why you choose the contraceptive methods you use—or choose not to use? Many factors can influence the contraceptive choices we make, some not as obvious as others. Do you choose what’s readily available in pharmacies because you don’t want to go to a clinic, even if another method might be more appropriate or effective for you? Do you use a method your health care provider recommended, even though you don’t like it? Do you go along with your partner’s preferences because it’s easier than saying what you would like?

What are the external factors that influence your choices about contraception? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

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SUMMARY

- Barrier methods of contraception physically prevent sperm from reaching the egg; hormonal methods are designed to prevent ovulation, fertilization, and/or implantation; and surgical methods permanently block the movement of sperm or eggs to the site of conception.
- The choice of contraceptive method depends on effectiveness, convenience, cost, reversibility, side effects and risk factors, protection against STDs, and noncontraceptive benefits. Measures of effectiveness include failure rate and continuation rate.
- Hormonal methods may include a combination of estrogen and progestins or progestins alone. Hormones may be delivered via pills, patch, vaginal ring, implants, or injections.
- Hormonal methods prevent ovulation, inhibit the movement of sperm, and affect the uterine lining so that implantation is prevented.
- IUDs can provide very effective long-term (5–10 years) contraception and are especially useful for women who have already been pregnant and are in monogamous relationships.
- Male condoms are simple to use, are immediately reversible, and provide STD protection; female condoms can be inserted hours before intercourse.
- The diaphragm, cervical cap, and contraceptive sponge cover the cervix and block sperm from entering; all are used with or contain spermicide.
- Vaginal spermicides come in the form of foams, creams, jellies, suppositories, and film.
- So-called natural methods include abstinence, withdrawal, and fertility awareness-based methods; the latter are based on avoiding intercourse during the fertile phase of a woman’s menstrual cycle. These methods are generally less effective than other contraceptive options.
- Combining methods can increase contraceptive effectiveness and help protect against STDs. The most common combination is a hormonal method, such as the birth control pill, combined with condoms.
- The most commonly used emergency contraceptives are Plan B One-Step and Next Choice, which are available without a prescription to men and women 17 and older.
- Vasectomy—male sterilization—involves severing the vasa deferentia. Female sterilization involves severing or blocking the oviducts so that the egg cannot reach the uterus.
- Key issues in contraception include decisions about when it is OK to have sex, gender differences in the significance of contraception, and sexuality education and contraception accessibility for teens.
- Issues to be considered in choosing a contraceptive include the individual health risks of each method, the implications of an unplanned pregnancy, STD risk, convenience and comfort level, type of relationship, the cost and ease of obtaining and maintaining each method, and religious or philosophical beliefs.

FOR MORE INFORMATION

Boston Women's Health Book Collective. 2011. *Our Bodies, Ourselves*. New York: Simon & Schuster. Broad coverage of many women's health concerns, with extensive coverage of contraception.

Glasier, A., and B. Winikoff. 2009. *Fast Facts: Contraception*, 3rd ed. Oxford: Health Press. Basic facts and figures related to contraceptive methods. Succinct and easy to read.

Guillebaud, J. 2007. *Contraception Today*, 6th ed. London: Informa Healthcare. A pocket guide popular with clinicians, but also useful to the layperson.

Hatcher, R. A., et al. 2011. *Contraceptive Technology*, 20th ed. New York: Bridging the Gap Foundation. A reliable source of up-to-date information on contraception.

Zieman, M., et al. 2010. *A Pocket Guide to Managing Contraception*, 2010–2012 ed. Tiger, GA: Ardent Media. An easy-to-use, reliable source of contraceptive information.

ORGANIZATIONS, HOTLINES, AND WEBSITES

Association of Reproductive Health Professionals. Offers educational materials about family planning, contraception, and other reproductive health issues; the website includes an interactive questionnaire to help people choose contraceptive methods.

<http://www.arhp.org>

Emergency Contraception Hotline. Provides information and referrals. 888-NOT-2-LATE

Emergency Contraception website. Provides extensive information about emergency contraception; sponsored by the Office of Population Research at Princeton University.

<http://ec.princeton.edu>

Guttmacher Institute. A nonprofit institute for reproductive health research, policy analysis, and public education.

<http://www.guttmacher.org>

It's Your Sex Life. Provides information about sexuality, relationships, contraceptives, and STDs; geared toward teenagers and young adults. Provided by the Kaiser Family Foundation and MTV.

<http://www.itsyoursexlife.com>

Kaiser Family Foundation: Women's Health Policy: Contraception. Provides information and reports focused on how policies impact reproductive health care and access to contraceptives.

<http://www.kff.org/womenshealth/contraception.cfm>

Managing Contraception. Provides brief descriptions and tips for using many forms of contraception. Features a detailed survey to help with contraceptive choices.

<http://www.managingcontraception.com>

Planned Parenthood Federation of America. Provides information on family planning, contraception, and abortion and provides counseling services.

<http://www.plannedparenthood.org>

The following are some of the many organizations focusing on family planning and reproductive health issues worldwide:

International Planned Parenthood Federation

<http://www.ippf.org>

United Nations Population Fund

<http://www.unfpa.org>

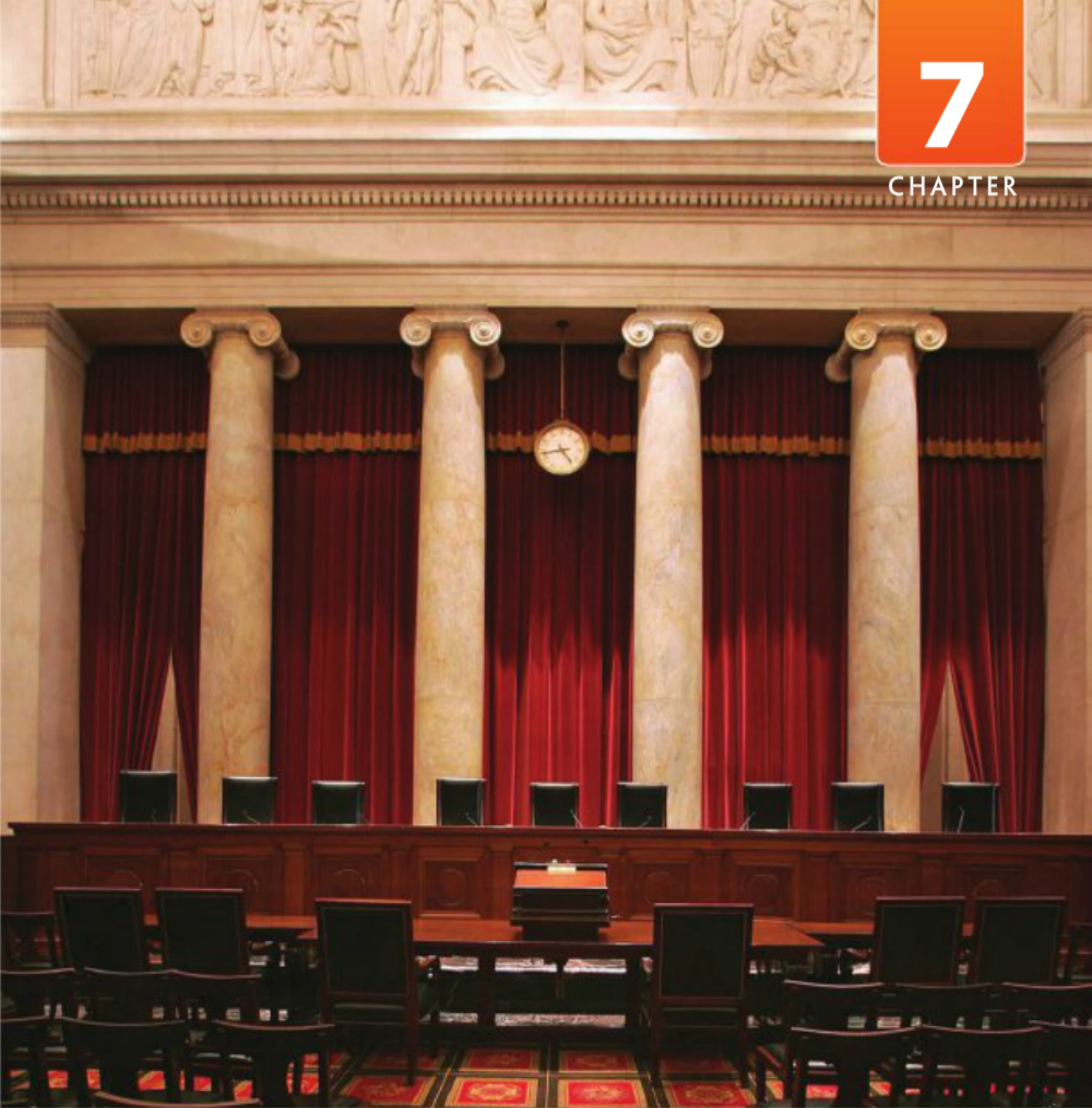
See also the listings for Chapters 5, 7, 8, and 18.

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Abortion



LOOKING AHEAD...

After reading this chapter, you should be able to

- Describe the history and current legal status of abortion in the United States
- Explain the current debate over abortion, including the main arguments of the pro-choice and pro-life points of view
- Describe the methods of abortion available in the United States
- List possible physical and psychological effects of abortion

TEST YOUR KNOWLEDGE

1. About what percentage of abortions in the United States take place in the first 13 weeks of pregnancy?
 - a. 70%
 - b. 80%
 - c. 90%
2. A majority of Americans are in favor of the right to a legal abortion in some circumstances. True or false?
3. The procedure known as “partial birth abortion” is one of the most commonly used methods of abortion. True or false?
4. At what point during pregnancy is a fetus generally considered to become viable, meaning it can survive outside the womb?
 - a. 12 weeks
 - b. 24 weeks
 - c. 48 weeks
5. Since the U.S. Supreme Court made abortion legal in all 50 states in its 1973 *Roe v. Wade* decision, more than half the states have enacted their own laws regulating abortion. True or false?

ANSWERS

1. **C.** Over 90% of all U.S. abortions take place in the first 13 weeks of pregnancy; more than 60% take place in the first 8 weeks.
2. **TRUE.** About 26% of Americans favor the right to legal abortion in all circumstances, and an additional 51% favor the right in some circumstances. About 20% of Americans think that abortion should be illegal in all circumstances.
3. **FALSE.** This method of abortion (correctly called *intact dilation and extraction*) is performed only rarely, representing less than 1% of all abortions in the United States.
4. **B.** Today most clinicians define this point as 24 weeks of gestation.
5. **TRUE.** Currently 40 states prohibit abortion after a certain point in pregnancy. However, these laws typically allow exceptions, such as when the mother's life or health is endangered, and they may not create an “undue burden” for women seeking an abortion.

Few issues are as complex and emotionally charged as abortion. In the United States, public attention has focused on the legal definition of abortion and the issues of how and when its practice should be restricted. While this debate is important, the most difficult aspects of abortion are personal—especially for women who must decide whether to have an abortion.

Most women who undergo abortions are young, and many college students have personal experience with unintended pregnancy and abortion. Therefore, college students are in a good position not just to debate the larger issues surrounding abortion, but also to consider the complex human factors involved in preventing pregnancy and dealing with unintended pregnancy.

This chapter offers basic information about abortion and touches on the controversy surrounding abortion.

THE ABORTION ISSUE

The word **abortion**, by strict definition, means the expulsion of an embryo or fetus from the uterus before it is sufficiently developed to survive outside the uterus. As commonly used, however, the term *abortion* refers only to those expulsions that are artificially induced by mechanical means or drugs. The term **miscarriage** is generally used when referring to a *spontaneous abortion*—one that occurs naturally with no causal intervention. In this chapter, *abortion* refers to a deliberately induced expulsion.

Abortion in the United States

For more than two centuries, abortion policy in the United States made the practice a crime only when performed after

“quickening” (fetal movement that begins at about 20 weeks). There was little public objection to this policy until the early 1800s, when an anti-abortion movement began. Led by physicians, the movement questioned the doctrine of quickening as well as the growing practice of abortion being performed by untrained persons.

In the mid-1800s newspaper advertisements for abortion preparations became common, and concern grew that women were using abortion as a means of birth control or to cover up extramarital activity. By the 1900s abortion was illegal in every state. These anti-abortion laws stayed in effect until the 1960s, when courts began to invalidate them on the grounds of constitutional vagueness and violation of the right to privacy.

Current Legal Status

In 1973 the U.S. Supreme Court made abortion legal in the landmark case of *Roe v. Wade*. To replace the restrictions most states still imposed at that time, the justices devised new standards to govern abortion decisions. They divided pregnancy into three parts, or *trimesters*, giving a woman less choice about abortion as her pregnancy advances toward full term.

According to *Roe v. Wade*, in the first trimester, the abortion decision must be left to the judgment of the pregnant woman and her physician. During the second trimester, similar rights remain up to the point when the fetus becomes **viable**—that is, capable of surviving outside of the uterus. Today most clinicians define this point as 24 weeks of gestation. When the fetus is considered viable, a state may regulate and even bar all abortions except those considered necessary to preserve the mother’s life or health.

Since 1973 many campaigns have been waged to overturn the *Roe v. Wade* decision, while other campaigns have tried to strengthen the rights provided by the decision. Although abortion remains legal throughout the United States, subsequent rulings by the Supreme Court have allowed states to regulate abortion throughout pregnancy as long as no “undue burden” is imposed on women seeking the procedure. As a result, states have passed multiple laws every year that regulate access to abortions. Some states have passed laws that limit access to abortion, while other states have passed laws that preserve the right to abortion. As a result, the laws surrounding abortion vary widely from state to state. For example,

- In 26 states where pre-abortion counseling is required, counseling must be followed by a waiting period before an abortion can be performed.
- In 37 states, parents must give consent or at least be notified before a minor can undergo an abortion.
- 40 states prohibit abortions after a specified point in pregnancy except in cases where the mother’s life or

health is endangered, where the pregnancy is the result of rape or incest, or where severe fetal abnormalities have been detected. These restrictions and their exceptions vary by state.

- In 32 states and the District of Columbia, the use of state funds for abortions is restricted except when the mother’s life is in danger or the pregnancy is the result of rape or incest.

Research into the effects of state restrictions has yielded mixed results. Some studies indicate that parental consent and notification laws may result in minors’ traveling out of state to get abortions. Mandatory delay laws have been found to influence the number and timing of abortions. Future research may help determine whether such restrictions place an undue burden on women seeking abortions.

Congress has barred the use of federal Medicaid funds to pay for abortions, except when a woman’s life is in danger or in cases of rape or incest. Currently 17 states provide nonfederal public money to assist some poor women seeking medically necessary abortions. Concerns have been raised that a two-tiered system has been created—one for women with the means to pay for an abortion and another for those without. The overall abortion rate declined 4% between 1999 and 2008, but the percentage of poor

women undergoing abortion rose from 27% to 42% during this period. Statistics consistently show that women below the federal poverty level have an abortion rate significantly high than that of higher-income women.

Public Opinion

Along with the legal debates are ongoing arguments between pro-life and pro-choice groups regarding the ethics of abortion.

Central to the pro-life position is the belief that the fertilized egg must be afforded the same rights as a human being from the moment of conception and that abortion at any time is equivalent to murder. This view holds that any woman who has sexual intercourse knows that pregnancy is a possibility, and should she willingly have intercourse and get pregnant, she is morally obligated to carry the pregnancy through. Pro-life followers encourage adoption for women who feel they are unable to raise a child and point out the number of couples seeking babies for adoption. Many pro-life supporters do not consider the availability of legal abortion as essential to wom-

QUICK

STATS

55% of reproductive-age American women live in states that are hostile toward abortion rights.

—The Guttmacher Institute, 2012

TERMS

abortion The artificially induced expulsion of an embryo or fetus from the uterus.

miscarriage A naturally occurring spontaneous abortion.

viable Capable of surviving outside of the uterus.



Pro-choice groups believe that the decision to end or continue a pregnancy is a personal matter. Pro-life groups oppose abortion on the basis of their belief that life begins at conception.

en's well-being but view it instead as having an overall destructive effect on our traditional morals and values.

In contrast, the pro-choice viewpoint holds that distinctions must be made between the stages of fetal development and that preserving the fetus early in pregnancy (or *gestation*) is not always the ultimate moral concern. Members of this group maintain that women must have the freedom to decide whether and when to have children; they argue that pregnancy can result from contraceptive failure or other factors out of a woman's control. (All contraceptive methods except abstinence have the potential for failure.) When pregnancy occurs, pro-choice supporters believe that the most moral decision possible must be determined according to each situation and that, in some cases, greater injustice could result if abortion were not an option. If legal abortions were not available, pro-choice supporters say, "back-alley shops" and do-it-yourself techniques, with their associated health risks, as well as the births of unplanned children, would again grow in number. Others argue that discrimination in health care would result because wealthy women could more easily make the travel arrangements necessary for a legal abortion elsewhere.

Both pro-choice and pro-life groups are active in virtually all American communities, seeking to advance their positions both by promoting legislation and by supporting political candidates who share their views.

Some people strongly identify exclusively with either the pro-life or the pro-choice stance, but many have moral beliefs that combine the two. Many people instinctively feel that the fetus gains increasing human value as a pregnancy advances. In this view, first-trimester abortion is acceptable but later-term abortion should be performed only when the mother's health is in jeopardy. Although the most vocal groups in the abortion debate tend to

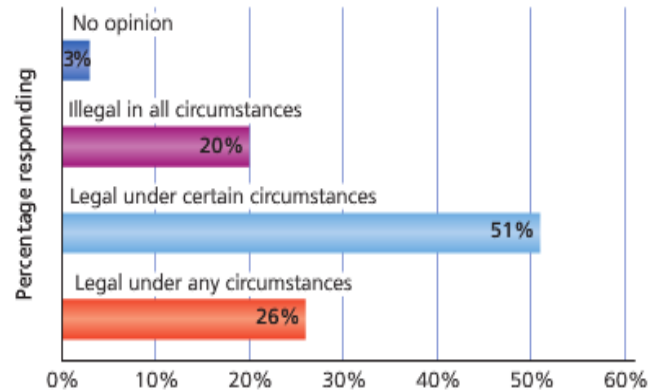


FIGURE 7.1 Public opinion about abortion.

SOURCE: Gallup, Inc. 2012. *Public Opinion about Abortion* (<http://www.gallup.com/poll/1576/abortion.aspx>). Copyright © 2012 Gallup Inc. All rights reserved. The content is used with permission; however Gallup retains all rights of republication.

paint a black-and-white picture, most Americans view abortion as a complex issue without any easy answers.

In general, U.S. public opinion on abortion seems to change depending on the specific situation. Many Americans approve of legal abortion as an option when destructive health or welfare consequences could result from continuing pregnancy. Overall, the majority of adults in the United States approves of legal abortion in certain instances. In July 2011 a Gallup Inc. poll showed that 26% of surveyed adults felt abortion should be legal under any circumstance, and 51% felt that abortion should be legal in certain situations. Additionally, the adults surveyed were evenly split between classifying themselves as "pro-life" and "pro-choice," at 47% each. Clearly, with the split opinions on this subject, public debate around abortion will continue into the future (see Figure 7.1).

Personal Considerations

For the pregnant woman who is considering abortion, the usual legal and moral arguments may sound meaningless as she

attempts to weigh the many short- and long-term ramifications for all those who are directly concerned. If she chooses abortion, can she accept the decision in terms of her own religious and moral beliefs? What are her long-term feelings likely to be regarding this decision? What are her partner's feelings regarding abortion, and how will she deal with his response? Does she know supportive people who will help her through the emotional adjustment? Which medical facility offering abortions would be most suitable for her? What about transportation and costs?

For the woman who decides against abortion and chooses instead to continue the pregnancy, there are other questions. If she decides to raise the child herself, will she have the resources to do it well? Is a supportive, lasting

QUICK STATS

More than one in three American women have an abortion before they turn 45.

—Planned Parenthood, 2012

relationship with her partner likely? If not, how does she feel about being a single parent? Are family members available to help with the many demands of child rearing? If she is young, what will be the effects on her own growth? Will she be able to continue with her educational and personal goals? What about the ongoing financial responsibilities?

If the pregnant woman considers adoption, she will have to try to predict her emotional responses throughout the full-term pregnancy and the adoption process. What are her long-term feelings likely to be? What is the best setting for her during pregnancy? How can she best continue with her life and long-term goals? What type of adoption would be most appropriate? (The box “The Adoption Option” addresses some of these questions.)

A Man's Rights Regarding Abortion

Discussions regarding abortion frequently focus on a woman's role in the decision and the effects on her mental and physical health. However, increasingly debated is the role the man should play in the decision to pursue an abortion. Multiple cases have been brought to the courts by men seeking the right to prevent an abortion. However, at this time, men do not have the legal right to prevent an abortion from occurring. The decision to pursue an abortion or not ultimately rests solely with the woman. Nevertheless, men are often involved in the decision-making process with their partners, and may experience a similar range of emotions as women. A small survey of men in the post-abortion period found that they experienced relief, a sense of responsibility, guilt, and grief in the months following an abortion, similar to the range of emotions felt by women.

About **1.2 million** abortions were performed each year from 2001 through 2008.

Abortion Statistics

Abortions are fairly common in the United States. Among American women, about 50% of all pregnancies are unintended; about 40% of such pregnancies end in abortion. About 22% of all pregnancies—wanted and unwanted—end in abortion, not including those that end in miscarriage. From 1973 through 2008, approximately 50 million legal abortions were performed in the United States.

After the Supreme Court's ruling in *Roe v. Wade*, the number of abortions rapidly increased in the United States (Figure 7.2). According to the Guttmacher Institute (a private organization that tracks statistics on reproductive health issues, including contraception and abortion), nearly 750,000 abortions occurred in 1973; the number rose each year after that until hitting a peak of 1.6 million in 1990. The number reported has steadily declined since then to around 1.2 million abortions performed each year from 2001 through 2008. Note, however, that abortion statistics vary considerably based on the

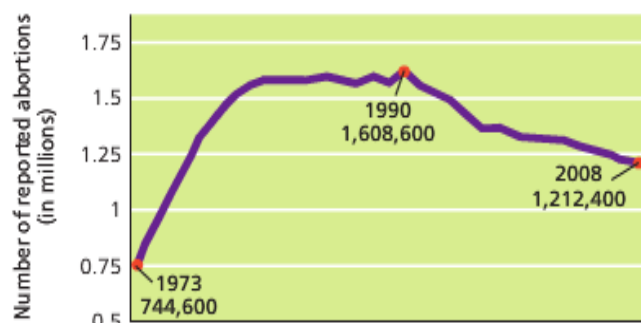


FIGURE 7.2 Number of reported abortions in the United States, 1973–2008.

SOURCE: Jones, R. K., et al. 2011. Abortion incidence and access to services in the United States, 2008. *Perspectives on Sexual and Reproductive Health* 43(1): 41–50.

source; the variations are due to state-by-state reporting requirements and other issues.

The number of late-term abortions has dropped over time, as well. In 2006, 91% of abortions occurred during the first 13 weeks (the first trimester) of pregnancy; about 1.3% were performed after the 21st week.

Planned Parenthood estimates that about one out of three American women will have an abortion by age 45. Women who choose to have an abortion vary widely; they represent various ages, religions, races, and levels of education. Therefore, it is impossible to paint a picture of a woman most likely to pursue an abortion of an unintended pregnancy. However, based on national research, American women who get abortions

- Are under age 25
- Have previously given birth
- Have never been married
- Are poor
- Live in a metropolitan area

Poverty has been strongly associated with having an abortion. In 2008, 42% of women undergoing an abortion were poor by federal standards. This may be due to decreased access to contraception, or due to increased financial concerns about raising a child.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Suppose you are in the position of lending support to a friend who has gone through an abortion. What sort of physical or emotional signals would you look for? What kind of support would you be willing to offer?



EMBRACING WELLNESS

The Adoption Option

Unintended pregnancies are very common. Approximately half of all pregnancies occurring in the United States are unintended. Every woman facing such a situation has three options: to continue the pregnancy, to seek an abortion, or to place her child up for adoption. Clearly this decision is highly individual, and the right answer for some is not the right answer for others. However, awareness of the options available can help a woman make an informed decision. Additionally, discussing the options with a trusted friend, partner, or family member may help make the decision clearer.

Around 40% of unintended pregnancies end in abortion. The rest of these pregnancies are continued, and only a very small portion of these pregnancies ultimately end in adoption. Before 1977, nearly 9% of unmarried pregnant women gave their children up for adoption. Today only 1% of women choose to place a child for adoption. This decline may be due to a variety of factors, including increased rates of contraceptive use and an easing of the social stigma of single parenthood. The drop in adoption rates in the 1970s probably reflected an increase in the abortion rate following the 1973 legalization of abortion. Since 1990, however, adoption rates have remained steady while the abortion rate has declined, indicating that women are not choosing abortion over adoption.

Women who place their children for adoption tend to come from higher socioeconomic backgrounds and to be better educated than those who choose to keep their babies or have an abortion. They are also likely to have greater educational and professional goals for themselves than those who keep their children. Often women who choose adoption come from supportive families who assist them throughout the experience.

The decision to go through an unwanted pregnancy and then give the baby to another family is difficult and takes tremendous maturity and courage. Adoption is permanent: the adoptive parents will raise the child and have legal authority for his or her welfare. Knowing this, the birth mother should think about her life now and in the future as she weighs alternatives.



Many people can help a pregnant woman consider her options, including her partner, friends, family members, a professional counselor, a crisis pregnancy center, a family planning clinic, or a family services, social services, or adoption agency. A counselor should always be respectful and willing to discuss all the options—keeping the baby, having an abortion, or arranging an adoption.

Adoptions can be confidential or open. In a confidential adoption, the birth parents and the adoptive parents never know each other. Adoptive parents receive any information they might need to take care of the child. A later meeting between the child and birth parents is possible in confidential adoption, however, if the birth parents leave information with the agency or lawyer who handles the adoption and/or in a national adoption registry.

In an open adoption, the birth parents and adoptive parents know something about each other. There are different levels of

openness, ranging from reading a brief description of prospective adoptive parents to meeting them and sharing full information. Birth parents may also be able to stay in touch with the family by visiting, calling, or writing.

In all states, a mother can work with a licensed child placement (adoption) agency. It may also be possible to work directly with an adopting couple or their attorney; this is called a private or independent adoption.

A woman who gives a child up for adoption should also consider the reaction and rights of the birth father. A woman can choose to have an abortion without the consent or knowledge of the father, but once the baby is born, the father has certain rights. These rights vary from state to state, but at a minimum, most states require that the birth father be notified of the adoption. In some states, the birth father may be able to take the child even if the mother prefers that the child go to an adoptive family. Working with an adoption agency can help navigate the laws surrounding abortion in each particular state.

As with abortion, there are emotional and physical risks associated with pregnancy, childbirth, and adoption. Throughout the adoption process, the mother should make sure that she has the help she needs and that she carefully considers all her options.

SOURCES: Child Welfare Information Gateway. 2010 Update. *Are You Pregnant and Thinking about Adoption?* (http://www.childwelfare.gov/pubs/f_pregna/index.cfm); Child Welfare Information Gateway. 2010 Update. *Voluntary Relinquishment for Adoption: Numbers and Trends* (http://www.childwelfare.gov/pubs/s_place.cfm).

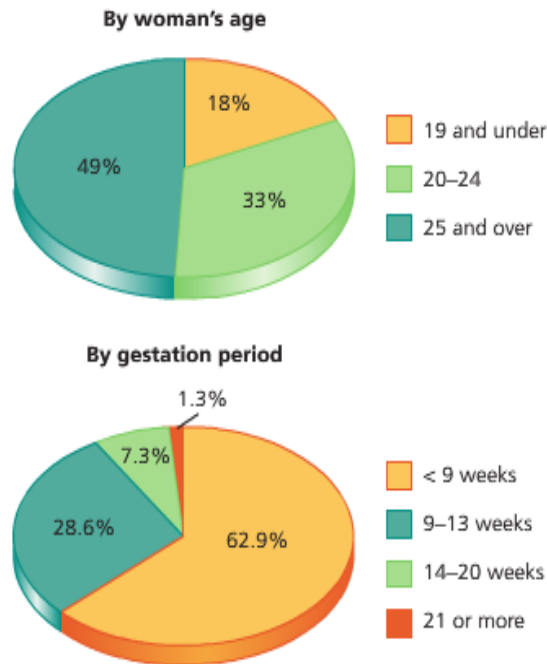


FIGURE 7.3 Distribution of abortions by the woman's age and by the weeks of gestation: 2008.

SOURCE: Jones, R. K., L. B. Finer, and S. Singh. 2010. *Characteristics of U.S. Abortion Patients, 2008*. New York: Guttmacher Institute; Centers for Disease Control and Prevention. 2012. Abortion surveillance—United States, 2008. *Morbidity and Mortality Weekly Report* 60 (SS15): 1–41.

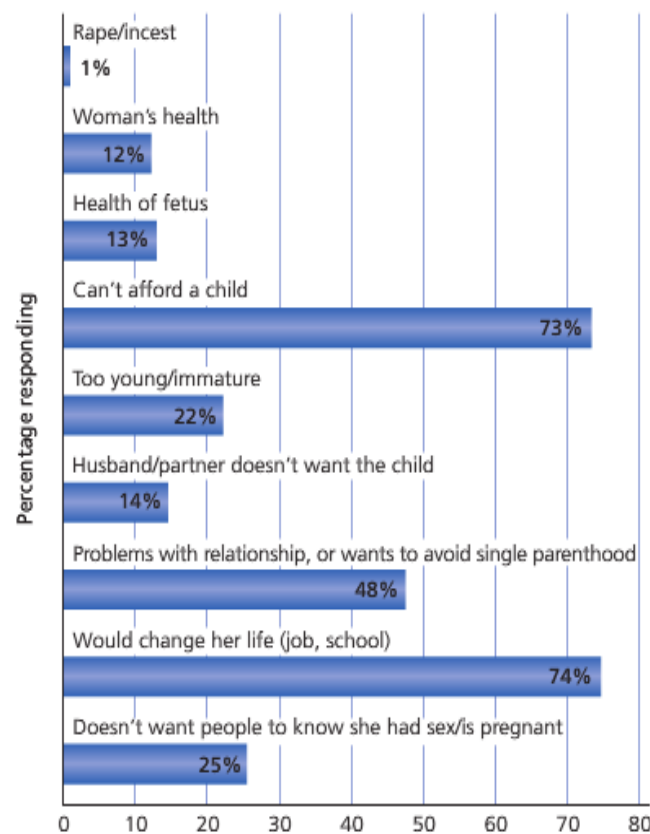


FIGURE 7.4 The reasons women choose abortions.

SOURCE: Finer, L. B., et al. 2005. Reasons U.S. women have abortions. Quantitative and qualitative perspectives. *Perspectives on Sexual and Reproductive Health* 37(3): 110–118.

METHODS OF ABORTION

Abortion methods can be divided into two categories: surgical and medical. Surgical abortion is by far the most common, accounting for about 85% of all abortions performed in the United States in 2008. Medical abortion, in which one or more drugs are used to induce abortion, accounted for 15% of all U.S. abortions in 2008. Medical abortions are discussed in detail later in this chapter.

Emergency contraception—pills taken or IUDs inserted immediately after unprotected sexual intercourse—are generally not considered abortifacients (agents that produce abortion) from a medical viewpoint because they act before implantation of the fertilized egg, if one is present (see Chapter 6). Therefore, these topics are not discussed here.

Suction Curettage

First developed in China in 1958, **suction curettage** (commonly known as *dilation and curettage*, or *D & C*) is the most common method for abortions performed from the 6th to the 12th week of pregnancy. The procedure can be done quickly, usually on an outpatient basis, and the risk of complications is small.

A sedative may be given, either through an IV or orally, prior to beginning the procedure. A speculum is inserted into the vagina, and the cervix is cleansed with a surgical solution. A local anesthetic may then be injected into the cervix. The cervix is dilated, and a specially designed tube, called a *suction curette*, is inserted into the uterus (Figure 7.5). The curette is attached to the rubber tubing of an electric pump, and suction is applied. In 20–30 seconds, the uterus is emptied. Moderate to severe cramping is common during evacuation, which rapidly subsides once the procedure is complete. To ensure that no fragments of tissue are left in the uterus, the doctor may scrape the uterine lining with a metal curette, an instrument with a spoonlike tip. The entire suction curettage procedure takes 5–10 minutes.

After a few hours in a recovery area, the woman can return home. She is usually instructed not to have intercourse or use tampons for several weeks after the abortion and to return for a postabortion examination. A follow-up exam is important to verify that the abortion was complete and that no signs of infection are present.

Manual Vacuum Aspiration

For more than 30 years, gynecologists have used **manual vacuum aspiration (MVA)** to manage incomplete abortions, for endometrial sampling in nonpregnant women, and for

suction curettage Removal of the embryo or fetus by means of suction.

manual vacuum aspiration (MVA) The vacuum aspiration of uterine contents, performed manually with a handheld syringe.

TERMS

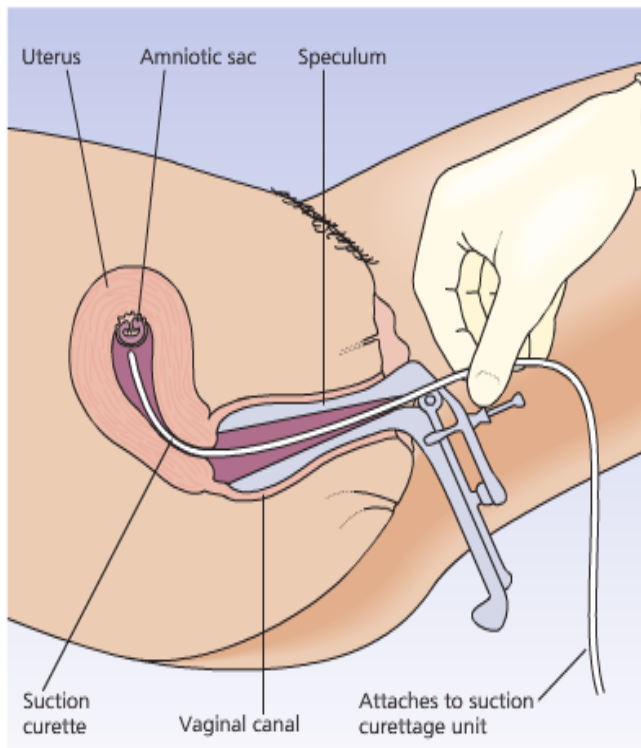


FIGURE 7.5 Suction curettage. This procedure takes 5–10 minutes and can be performed up to the 12th week of pregnancy.

elective abortion. During this procedure, as in suction curettage, the woman receives a local anesthetic and her cervix is dilated. A plastic tube attached to a handheld syringe is inserted through the cervix and into the uterus. The syringe provides gentle suction, which empties the uterus.

MVA has several advantages over suction curettage. Manual vacuum aspiration does not require an electric pump or additional equipment, and therefore it can be used in a wider variety of settings. It is also significantly cheaper than suction curettage, and it has been successfully used by midlevel providers such as midwives and nurses. For these reasons, MVA is ideal for low-resource settings. And MVA is quiet, which may be beneficial for the woman undergoing the abortion: many women report being disturbed by the loud noise made by electric suction curettage. A number of recent studies have shown that the two techniques have equivalent safety profiles and low rates of complications when done up to 10 weeks of gestation.

Multi-Fetal Pregnancy Reduction (MFPR)

Multi-fetal (twin and higher multiple) pregnancies are associated with high fetal morbidity and mortality rates. **Multi-fetal pregnancy reduction (MFPR)** is a procedure that reduces the number of fetuses in a multiple pregnancy. It is usually

performed during the first trimester. In the most common method of MFPR, the fetal heart is injected with potassium chloride. The dead fetus is then absorbed by the mother's body. Multi-fetal reduction reduces the risk of preterm delivery for the remaining fetus and improves maternal pregnancy outcomes.

Abortion after the First Trimester

Only about 1 in 10 abortions is performed after the 12th week of pregnancy. The method most commonly used for abortion from 13 to 24 weeks of pregnancy is **dilation and evacuation (D & E)**. Depending on the gestational age of the fetus at the time of the abortion, cervical dilators may be placed within the cervix the day prior to the procedure, which gradually expand within the cervix overnight while the woman is at home. The next day, the uterus is emptied using surgical instruments and an aspirating machine. The more advanced the pregnancy, the higher the incidence of complications such as bleeding, infection, or incomplete abortion. When performed by a trained provider, however, complication rates remain low.

Intact dilation and extraction (known controversially as *partial birth abortion*) is a surgical abortion wherein an intact fetus is removed from the uterus. Occasionally the skull is collapsed after fetal limbs and body are delivered to allow it to pass more easily through the cervix. This procedure is performed only rarely, representing less than 1% of all abortions in the United States. Experts say that intact dilation and extraction can be useful when certain fetal anomalies are present, such as severe hydrocephalus (swelling of the fetus's head), and that the procedure may be the safest option for the mother in some circumstances. Intact dilation and extraction became illegal after the 2007 Supreme Court ruling in the case of *Gonzales v. Carhart*, even in situations where the mother's health may be in jeopardy.

Labor induction is another infrequently used method of late abortion. Prostaglandins, chemicals that cause uterine contractions, are used to induce labor, sometimes in conjunction with placement of cervical dilators. The

QUICK STATS

Only 11% of U.S. abortion service providers offer abortions at 24 or more weeks of gestation.

—Guttmacher Institute, 2011

TERMS

multi-fetal pregnancy reduction (MFPR)

A method of abortion used to reduce the number of fetuses in a multiple-fetus pregnancy.

dilation and evacuation (D & E) The method of abortion most commonly used between 13 and 24 weeks of pregnancy. Following dilation of the cervix, both vacuum aspiration and curettage instruments are used as needed.

intact dilation and extraction A rarely used method of late-term abortion, wherein an intact fetus is removed from the uterus.

labor induction An infrequently used method of late-term abortion, in which chemicals or medications are used to induce abortion and labor.

DIVERSITY MATTERS

Abortion around the World



The legal status, availability, and safety of abortion vary widely around the world. According to the World Health Organization (WHO), there were about 208 million pregnancies worldwide in 2008; over 43 million of those pregnancies ended in induced abortions. Six million of these abortions occurred in developed nations, while over 37 million occurred in developing nations. Although this significant difference in numbers is due in part to the much larger population in developing nations, it is also due to a higher rate of abortions. Abortions occur at a rate of 24 per 1,000 women aged 15–44 in developed countries, whereas this rate is 29 in developing countries.

In developed countries, the WHO estimates that more than 99% of induced abortions are performed safely. In developing countries, by contrast, more than 56% of abortions are unsafe. An unsafe abortion is a procedure performed by a person without the appropriate training or in a setting that does not conform to medical standards. The vast majority of unsafe abortions occur in developing countries with restrictive abortion laws and where access to family planning and abortion services is limited.

Many countries with strict anti-abortion laws have high rates of abortion. For example, the abortion rate is high in Africa and Central America even though many countries in these regions have some of the most restrictive abortion laws in the world. Because the procedure is commonly performed secretly and in unsafe

conditions, those countries also have high rates of serious complications. The WHO estimates that 8.5 million women suffer complications from unsafe abortions each year, and about 47,000 of these women die from their complications, representing 13% of all deaths related to pregnancy. Fortunately, this number has been on the decline in recent years.

While restrictive abortion laws have been associated with increased mortality rates, the converse is also true: the ability to obtain a legal abortion leads to decreased mortality rates associated with abortion. For example, in the United States, the mortality rate is 0.6 deaths per 100,000 procedures, while the mortality rate associated with unsafe procedures is 220 per 100,000 procedures worldwide.

Legal status is not the only factor that determines whether a woman has access to safe abortion services. The way laws are interpreted can be just as critical. For example, in some countries that allow abortion for mental health reasons, the law is interpreted to allow the majority of women seeking abortions to obtain them; in other countries with similar laws, few abortions are allowed. Enforcement of abortion laws is also a factor and varies from country to country.

The attitudes and beliefs of the medical community also influence the availability of abortion services. In Nigeria, for example, many physicians perform abortions despite legal bans because the medical community believes in the need for safe

abortion services. In contrast, major medical associations in Poland and the Republic of Ireland have adopted guidelines that are stricter than their country's laws.

The number and location of abortion providers and the cost of abortion services also influence the true availability of abortion in a particular country, regardless of its actual legal status. Community and physician opposition to abortion has left parts of the United States, Austria, and Germany without abortion providers, despite the fact that abortion is legal in all three countries. In contrast, policies in Denmark go beyond just permitting safe abortion to ensuring that services are widely available. There, each county must have at least one hospital with the capability of providing abortion services, and the services are free.

SOURCES: Guttmacher Institute. 2012. *In Brief: Facts on Induced Abortion Worldwide* (http://www.guttmacher.org/pubs/fb_IAW.html); Singh, S., et al. 2009. *Abortion Worldwide: A Decade of Uneven Process*, New York: Guttmacher Institute; World Health Organization. 2007. *Unsafe Abortion: Global and Regional Estimates of Incidence of Unsafe Abortion and Associated Mortality in 2003*, 5th ed. World Health Organization, Geneva; Sedgh, G., et al. 2012. Induced abortion: Incidence and trends worldwide from 1995 to 2008. *Lancet*, in press.

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delivery of the fetus usually occurs in 6–24 hours. The woman is hospitalized during this process.

Medical Abortion

Medical abortion is generally used in very early pregnancy, within 49 days of the last menstrual period. The combination of drugs that is given causes the embryo and products of conception to be passed out through the vagina, as in a natural miscarriage. An ultrasound may be performed before giving the medication to make sure that the pregnancy dates are accurate because complication rates for medical abortion are higher if the pregnancy is more advanced.

Advantages and Disadvantages of Medical Abortion

There are advantages and disadvantages associated

with choosing a medical abortion over a surgical abortion. Some women feel that medical abortion allows them to take more control of the procedure and gives them more privacy than a surgical abortion would. Additionally, some women feel it is a more “natural” process because the process mimics a miscarriage. It is also a noninvasive alternative to surgical abortion because no instruments are introduced into the uterus.

The major disadvantages of medical abortion are that the process can take days to complete (early surgical abortion generally takes less than an hour and can be done under sedation) and that bleeding after the procedure is often heavier and lasts longer than with surgical abortion. Medical abortion also generally requires more clinic visits than surgical abortion, and there is a small risk of failure of the abortion, which would then require a suction curettage to complete the procedure. The cost to the patient is generally about the same.

Drugs Used for Medical Abortion Mifepristone, misoprostol, and methotrexate are three drugs widely used for medical abortion. Mifepristone (also known as RU-486 and sold under the brand name Mifeprex) blocks the effect of progesterone that is produced by the ovaries after implantation of the fertilized egg. The loss of progesterone support causes the uterine lining and any fertilized egg to shed. Mifepristone is currently approved for use up to 49 days following the last menstrual period, though some practitioners will prescribe it up to 63 days following a missed period, with a slightly higher failure rate. A woman takes a dose of mifepristone and follows it 6 to 48 hours later with a second drug, the prostaglandin misoprostol, which induces uterine contractions. The two-drug regimen has a rate of completed abortion of about 92–95%; the success rate is highest early in pregnancy.

Side effects include nausea, vomiting, diarrhea, and abdominal pain. Vaginal bleeding is often more prolonged than with surgical abortion (9–16 days), but total blood loss is similar. In a few cases, bleeding is heavy, and a follow-up suction curettage is necessary to complete the abortion in a small percentage of women. This is generally done in a hospital emergency department or a clinic. With mifepristone and misoprostol, abortion can take anywhere from a few hours to several days; about 50% of abortions occur within 4 hours, and 75% within 24 hours. Two weeks after taking mifepristone, a woman must return to her health care provider for a follow-up visit to ensure that the abortion is complete.

Since the FDA's approval of mifepristone in 2000, several deaths have been linked with medical abortion. In 2006 the FDA investigated the deaths of five American women after intravaginal administration of the second medication, misoprostol. The five deaths were all linked to sepsis (blood or tissue poisoning) caused by a *Clostridium* species bacterial infection. *Clostridium* species bacteria are normally present in the vaginas of up to 10% of women. At the end of the investigation, the FDA concluded that there was no established causal link between the deaths and mifepristone. However, the FDA required the placement of a black box warning on Mifeprex to inform patients of the sepsis cases and to alert them to signs and symptoms of possible sepsis.

Most recently, cases of *Clostridium* sepsis have been identified after spontaneous miscarriage, childbirth, and other gynecologic procedures (where neither mifepristone nor misoprostol were used). Ongoing studies are looking at the risk factors for the rare development of sepsis from *Clostridium* bacteria after a medical termination and other procedures.

Methotrexate can also be used with prostaglandin for early medical abortion. Methotrexate stops the embryonic or fetal cells from dividing; it is followed by a dose of prostaglandin in a regimen similar to that for mifepristone. With this combination of drugs, 80–85% of women will abort within two weeks; up to 95% will abort within 30 days. Mifepristone acts more quickly than methotrexate, has fewer side effects, and is slightly more effective. For these reasons, mifepristone has become the preferred drug for medical abortion. However, methotrexate may be used if there is suspicion of ectopic pregnancy (pregnancy implanting outside the uterus) or in settings where mifepristone is not available.

COMPLICATIONS OF ABORTION

Along with questions regarding the actual procedure of abortion, many people have concerns about possible aftereffects. More information is gradually being gathered about this important subject.

Possible Physical Effects

The incidence of immediate problems following an abortion (infection, bleeding, trauma to the cervix or uterus, and incomplete abortion requiring repeat curettage) varies widely. The potential for problems is significantly reduced by a woman's good health, early timing of the abortion, use of the suction method, performance by a well-trained clinician, and the availability and use of prompt follow-up care.

Problems related to infection can be minimized through preabortion testing and treatment for gonorrhea, chlamydia, and other infections. Some clinicians routinely give antibiotics after an abortion, whereas others treat only those women who have a history or current symptoms of pelvic infection. Postabortion danger signs are as follows:

- Fever above 100°F.
- Abdominal pain or swelling, cramping, or backache.
- Abdominal tenderness (to pressure).
- Prolonged or heavy bleeding.
- Foul-smelling vaginal discharge.
- Vomiting or fainting.
- Delay in resuming menstrual periods (six weeks or more).

Some cramping and bleeding are an expected part of ending a pregnancy. In rare cases, life-threatening bleeding, infections, or other problems can occur following a miscarriage, surgical abortion, or medical abortion. Prompt medical attention should be sought if heavy bleeding, severe abdominal pain, or fever occurs. Excessive bleeding during or after an abortion is rare with early suction curettage. In later-stage pregnancies, the use of uterus-contracting medication significantly reduces the risk of bleeding. Some pain medications may increase bleeding, so patients should check with their physician about appropriate medications for postoperative pain.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What is your opinion on the issue of late-term abortion? Do you feel it is never acceptable, or is it acceptable under certain circumstances? If so, what are those circumstances?

Incomplete abortion means that some pregnancy tissue has remained in the uterus. With this condition, or when blood clots form in the uterus shortly after an abortion, severe cramping and signs of infection can occur, and a repeat suction curettage is usually needed. On rare occasions, a pregnancy may continue after an incomplete abortion. The recommended follow-up exam is important to establish that the abortion was complete.

Missed ectopic pregnancy is another potentially serious problem that can surface after an abortion. Surgical abortion techniques remove tissue from the uterus but will miss an ectopic pregnancy developing outside the uterus. If an ectopic pregnancy goes untreated, the embryo can eventually become large enough to rupture the fallopian tube, causing potentially catastrophic bleeding. Tissue removed during an abortion is normally examined for evidence that the gestational sac or embryo has been removed. If there is any doubt, ultrasound and follow-up pregnancy testing can reveal whether an ectopic pregnancy is present.

The overall risk of death is low. Mortality rates have decreased substantially since abortion was legalized in 1973 (Table 7.1).

Unsafe Abortions

Unsafe abortion is defined as abortion done either by people lacking the necessary skills or in an environment lacking minimal medical standards. These include abortions in countries where the law is restrictive, or abortions that do not meet legal requirements in countries where the law is not restrictive.

The World Health Organization estimates that, worldwide, about one-half of all abortions are unsafe; the majority of them are done in developing countries. Poor women in rural areas, where trained providers may not be available or affordable, are at highest risk of undergoing unsafe abortions. In undeveloped regions, many methods of abortion are based on cultural or traditional practices and include repeated blows to the abdomen;

insertion of stones, twigs, or sharp wire objects into the vagina and cervix; and drinking or flushing the vagina with caustic substances.

Immediate complications from unsafe abortions include severe bleeding, uterine perforation, tearing of the cervix, damage to genitals and abdomen, infection, and sepsis. Long-term complications include pelvic inflammatory disease and infertility.

The root causes of unsafe abortions are unmet needs for contraception, restrictive abortion laws, and prohibitive costs of a safe abortion. Unsafe and safe abortions correspond in large part with illegal and legal abortions. More numerous and restrictive abortion laws do not lower abortion incidence; rather, they increase the rates of unsafe abortions. For example, in South Africa, the rates of infection from abortion decreased by 50% after a more liberal abortion law went into effect in 1996. Improving access to contraceptive services dramatically decreases rates of both safe and unsafe abortions.

Possible Psychological Effects

After an exhaustive review completed in 1988, the then–surgeon general, C. Everett Koop, concluded that the available evidence failed to demonstrate either a negative or a positive

long-term impact of abortion on mental health. More recent research has resulted in the same general conclusion. The frequency of any psychiatric diagnoses in women who have undergone an abortion procedure is no higher than in women with no such history.

The psychological side effects of abortion, however, are less clearly defined than the physical ones. Responses vary and depend on the individual woman's psychological makeup, family background, current personal and social relationships, cultural attitudes, and many

other factors. A woman who has specific goals with a somewhat structured life may be able to incorporate her decision to have an abortion as the unequivocally best and most acceptable course more easily than a woman who feels uncertain about her future.

Although many women experience relief after an abortion, some go through a period of sadness while making the decision to proceed with an abortion or shortly after it is performed. They may also feel guilt, regret, loss, or anger. When a woman feels she was pressured into sexual intercourse or into the abortion, she may feel bitter. If she had strongly believed abortion to be immoral, she may wonder if she is still a good person. Many of these feelings are strongest immediately after the abortion. Such feelings often pass rapidly. Others take time to resolve and fade only slowly. It is important for a woman to realize that a mixture of feelings is natural.

For a woman who experiences psychological or emotional effects after an abortion, talking with a close friend or family member can be helpful. Supportive people can help her feel positive about herself and her decision. Although a legal and common procedure in the United States, abortion is still treated secretly in most of our society, so it is easy for a woman to feel isolated and alone. Many clinical centers that offer abortions

Abortion-related mortality rates have declined substantially since abortion was legalized in 1973.

Table 7.1 Abortion Risks

PROCEDURE	RISK OF DEATH
Medical abortion	1 in 162,500
Surgical abortion	
Before 9 weeks	1 in 1,000,000
9–10 weeks	1 in 500,000
11–12 weeks	1 in 250,000
13–15 weeks	1 in 58,800
16–20 weeks	1 in 29,400
After 20 weeks	1 in 11,200

SOURCES: Adapted with permission from Table 3-3 in Hatcher, R. A., et al. 2008. *Contraceptive Technology*, 19th rev. ed. New York: Ardent Media.



Physical aftereffects of abortion are minimized when a woman is in good health and receives good care. Emotional aftereffects can vary and may include both relief and regret. Supportive counseling can help with unresolved ambivalent feelings.

make peer counseling available. Other women find they can identify with case histories in books written on abortion, which can help them deal with their own reactions. If unresolved emotions persist, a woman should seek professional counseling.

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Connect to Your Choices

Have you ever thought about where you get your ideas and beliefs about abortion? Many factors can influence our views on this issue, some not as obvious as others. Do you hold the same beliefs as your parents? Do you identify with a political party that takes a stand, either pro-life or pro-choice, on abortion? Do groups on your campus express their views in an outspoken way?

What are the external factors that influence your views on abortion? What are your inner motivations and core values, and how do they affect your views? Based on what you learned in this chapter, do you think your views will ever change? If so, what changes do you anticipate?

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TIPS FOR TODAY AND THE FUTURE



You may never have to face an unintended pregnancy, but you should know what choices you would have, as well as where you stand on the issue of abortion.

RIGHT NOW YOU CAN:

- Examine your feelings about the possibility of becoming a parent, especially if it were to happen unintentionally.
- Consider your views on the morality of abortion, and whether it is acceptable under certain circumstances.

IN THE FUTURE YOU CAN:

- If you are sexually active or plan to become sexually active, talk to your partner about abortion. Do you share similar views and feelings, or are they different? How would you resolve conflicts about this issue?
- If you are sexually active, reexamine your contraceptive method and make sure you have made the right choice. Remember that, aside from abstinence, no method of contraception is 100% effective.

SUMMARY

- The common use of the word *abortion* refers only to artificially induced expulsion of the fetus. The term *miscarriage* is used to describe a naturally occurring spontaneous abortion.
- Until the mid-1800s, abortion in the United States was legal if it took place before the 20th week of pregnancy; more restrictive laws passed by the various states remained in effect until courts began to invalidate them in the 1960s.
- The 1973 *Roe v. Wade* Supreme Court case devised new standards to govern abortion decisions; based on the trimesters of pregnancy, it limited a woman's choices as her pregnancy advanced.
- Although the Supreme Court continued to uphold its 1973 decision, later rulings gave states further power to regulate abortion.
- The controversy between pro-life and pro-choice viewpoints focuses on the issue of when life begins. Pro-life groups believe that a fertilized egg is a human life from the moment of conception and that any abortion is a murder. Pro-choice groups distinguish between stages of fetal development and argue that a woman should make the final decision regarding her pregnancy.
- Overall public opinion in the United States supports legal abortion in at least some circumstances and opposes overturning *Roe v. Wade*. Opinion changes according to individual situations.
- Most people agree that abortions performed late in pregnancy present personal, medical, philosophical, and social problems.
- The woman considering abortion must think about her own religious and moral beliefs, her long-range reactions, support from others, and the cost and availability of the procedure.

- In suction curettage, the preferred method of abortion from the 6th to the 12th week of pregnancy, an electric pump is used to remove the uterine contents; also, the physician scrapes the uterine lining with a metal curette.
- Manual vacuum aspiration is the aspiration of the uterine contents using suction provided by a handheld syringe.
- The most common abortion method after the first trimester is dilation and evacuation (D & E), in which the uterus is emptied using aspiration and surgical instruments.
- Intact dilation and extraction and labor induction are rarely used methods of late-term abortion. The intact dilation and extraction method became illegal in 2007, following a Supreme Court ruling.
- Multi-fetal pregnancy reduction (MFPR) is a method of abortion used to reduce the number of fetuses in a multiple-fetus pregnancy.
- Medical abortion is performed with a combination of drugs very early in pregnancy; drugs used include mifepristone, misoprostol, and rarely methotrexate.
- Physical complications following abortion can be minimized by overall good patient health, early timing, use of the suction method, a well-trained physician, and follow-up care.
- Psychological aftereffects of abortion vary with the individual. Many women go through a period of ambivalence; the strongest feelings usually occur immediately after the abortion. Having a supportive partner, friend, or family member can be helpful.

FOR MORE INFORMATION

BOOKS

Adamec, C. A., and L. C. Miller. 2006. *The Encyclopedia of Adoption* (Facts on File Library of Health and Living), 3rd ed. New York: Facts on File, Inc. Covers a wide range of adoption-related issues, such as gay/lesbian adoptions, the rights of birth fathers, transracial adoptions, and international adoptions.

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Davenport, D. 2006. *The Complete Book of International Adoption*. New York: Broadway Books. A detailed look at the process of adopting children from different countries.

National Abortion and Reproductive Rights Action League Foundation. 2008. *Who Decides? A State-by-State Review of Abortion and Reproductive Rights*. Washington, DC: NARAL Foundation. An in-depth annual review of the legal status of reproductive rights in the United States.

Nolan, K. G. 2010. *Abortion: Legislative and Legal Issues*. New York: Nova Science Publishers. An examination of the legal history of abortion in the United States.

ORGANIZATIONS AND WEBSITES

Child Welfare Information Gateway. A clearinghouse of information about many aspects of child-raising, including adoption.
<http://www.childwelfare.gov>

Guttmacher Institute. Publishes books and fact sheets about reproductive health issues; its journal, *The Guttmacher Policy Review*, provides timely analysis of national reproductive health policy debates.
<http://www.guttmacher.org>

Guttmacher Institute State Center. National and state-by-state analysis of public policies on reproductive rights and abortion.
<http://www.guttmacher.org/statecenter>

MedlinePlus: Abortion. Managed by the National Library of Medicine and the National Institutes of Health, this site provides a list of informational resources about various aspects of abortion.
<http://www.nlm.nih.gov/medlineplus/abortion.html>

National Abortion and Reproductive Rights Action League. Provides information about the politics of the pro-choice movement. Also provides information about the abortion laws and politics in each state.
<http://www.prochoiceamerica.org>

National Abortion Federation. Provides information and resources on the medical and political issues relating to abortion; managed by health care providers.
<http://www.prochoice.org>

National Adoption Center. A national agency focused on finding adoptive homes for children with special needs or who are currently in foster care.
<http://www.adopt.org>

National Right to Life Committee. Provides information about alternatives to abortion and the politics of the pro-life movement.
<http://www.nrlc.org>

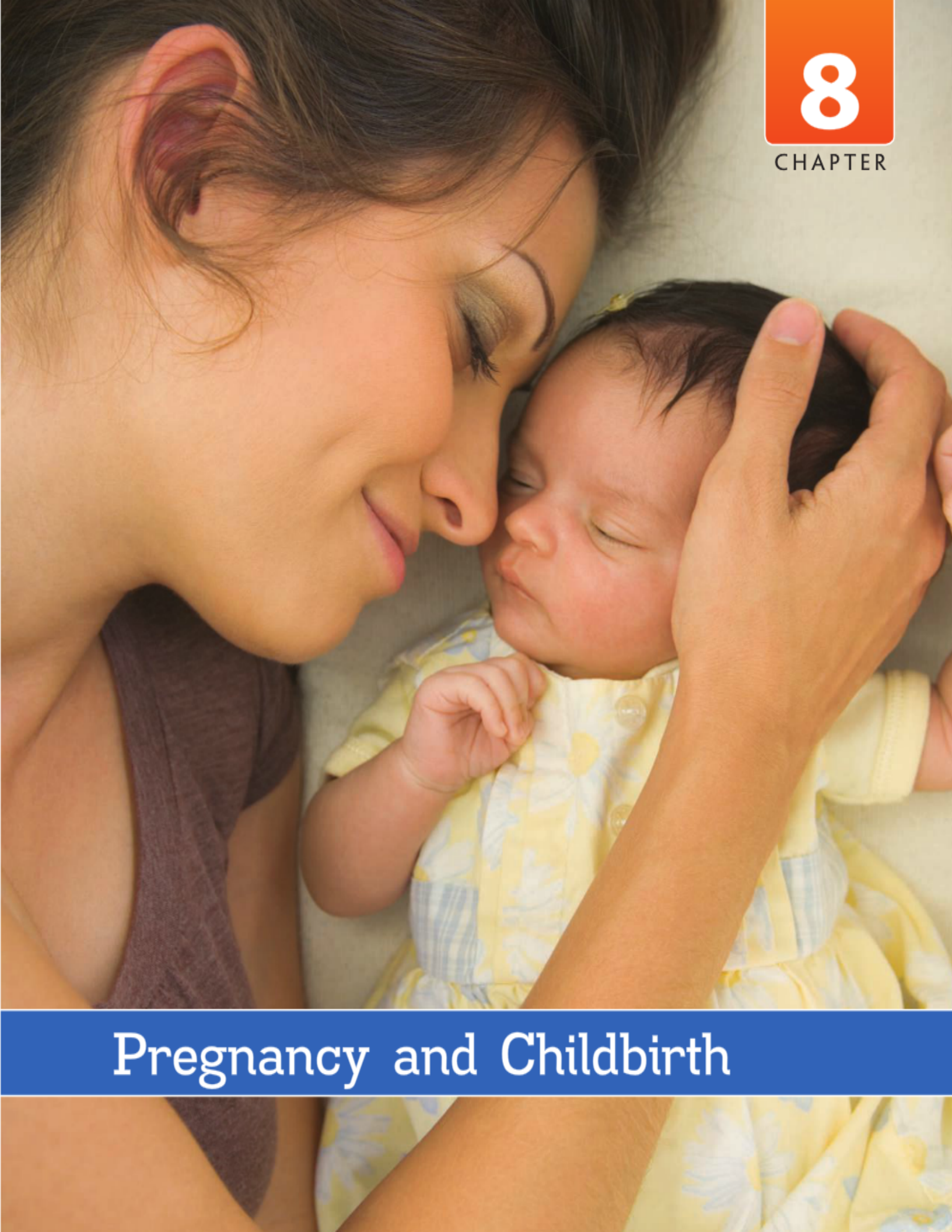
Planned Parenthood Federation of America. Provides information about family planning, contraception, and abortion and provides counseling services.
<http://www.plannedparenthood.org>

See also the listings for Chapters 5, 6, and 8.

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Pregnancy and Childbirth

LOOKING AHEAD...

After reading this chapter, you should be able to

- List key issues to consider when deciding whether to become a parent
- Explain the process of conception
- Describe the most common causes of and treatments for infertility
- Describe the physical and emotional changes a pregnant woman typically experiences
- Identify the stages of fetal development
- List the important components of good prenatal care
- Describe the process of labor and delivery

TEST YOUR KNOWLEDGE

1. What is the approximate annual cost of raising one child?
 - a. \$5,500–\$11,000
 - b. \$8,500–\$23,000
 - c. \$11,000–\$22,000
2. A fertilized egg is called a *blastocyst*. True or false?
3. Before conception and in the early weeks of pregnancy, adequate intake of which of the following nutrients can reduce the risk of spina bifida and other neural tube defects?
 - a. iron
 - b. folic acid
 - c. calcium
4. Cigarette smoking before or during pregnancy is linked to which of the following?
 - a. congenital anomalies
 - b. low birth weight
 - c. miscarriage
 - d. central nervous system defects

ANSWERS

1. **B.** A two-parent, two-child family will spend from \$8,500 to \$23,000 per child per year, depending on the family's income level, to raise their children to age 18.
2. **FALSE.** A fertilized egg is called a *zygote*.
3. **B.** All reproductive-age women are recommended to consume a minimum of 400 µg of folic acid from fortified foods and/or supplements each day to reduce the risk of spina bifida and other neural tube defects.
4. **ALL FOUR.** Maternal smoking during pregnancy is associated with birth defects, low birth weight, and increased frequencies of behavioral and psychological abnormalities. Also, the risk of having a miscarriage is 20–80% higher among women who smoke cigarettes during pregnancy.

Deciding whether to become a parent is one of the most important choices you will ever make. Yet many people approach this decision with only a vague notion of what is involved in pregnancy and childbirth.

Previous generations of Americans assumed that every married couple would have children. Today, with changing cultural expectations and more sophisticated contraceptive technology, you can choose whether and when to have a child. As a result of these changes, the average age of first-time mothers in the United States has increased steadily, from 21.4 years in 1970 to 28.0 years in 2009.

The more you know about conception, embryology, pregnancy, prenatal care, childbirth, and parenting, the better able

you will be to make informed decisions about them. This chapter presents information you can use now and later in life to make choices about pregnancy and childbirth that are right for you.

PREPARATION FOR PARENTHOOD

Before you decide whether or when to become a parent, you should consider your suitability and readiness. If you elect to have a child, there are actions you can take before the pregnancy begins to help ensure a healthy outcome for all.

Deciding to Become a Parent

Men and women alike should consider a number of factors when deciding whether to become parents. Some issues are relevant to both men and women; others apply only to women.

Health and Age Generally speaking, healthier women tend to have more trouble-free pregnancies and healthier babies. Women considering motherhood should see their physicians for complete medical checkups to catch problems that can interfere with pregnancy or childbirth. For example, high blood pressure, diabetes, renal disease, cardiac disease, and rheumatologic disorders may require ongoing attention; if uncontrolled, these health problems can pose life-threatening dangers to a mother or child.

A mother's age can also be a factor in pregnancy and childbirth. Teenagers and women over age 35 have a higher incidence of certain problems that can affect the health of both mother and baby. In fact, most experts automatically classify a pregnancy as "high-risk" if the mother is over age 35, especially if it is her first pregnancy.

Emotional Preparedness Just as they need to be physically prepared, parents also need to be emotionally ready to have a child. A new baby is totally helpless and relies on adults for everything. For parents, this means being strong and stable enough to handle the responsibility and being mature enough to give up certain freedoms in order to care for a child.

Relationships The stress and expense of child rearing can strain any relationship, even a healthy one. This is why it is important for couples to plan for parenting. Through open, honest discussion, partners should make sure they are both ready to take the step of having a child. Both should be equally committed to parenthood and agree on matters of child care, housework, and other day-to-day responsibilities. Couples with relationship problems should work together to resolve their issues—with professional help, if necessary—before adding a child to the mix.

New parents also need a strong support network of friends and family members who can lend a hand when things get tough. Many first-time parents count on their own parents and siblings for aid with child care or household chores. It can be easy, however, to alienate family and friends with too many requests for assistance. To avoid this problem, parents-to-be should include members of their support network in the planning process to figure out who will be able to help, in what ways, and at what times.

Financial Circumstances Parenthood is financially draining, even for families with steady incomes and health insurance. According to a 2010 report from the U.S. Department of Agriculture, a two-parent, two-child family will



A young couple with hopes of parenthood can make their lives easier by creating a long-term financial plan. This couple is consulting with a certified financial adviser about their future plans.

spend from \$8,500 to \$23,000 per year per child, depending on the family's income level, to raise each child to age 18. Expenses increase significantly with each additional child.

If you plan to have a child, try to be prepared financially—especially during the first few years, when the costs of diapers, furniture, pediatrician visits, and other necessities quickly add up. It makes good sense for all expecting parents to consult with a financial planner, regardless of income level. A qualified financial planner can help new parents see their larger financial picture and focus on issues such as taxes, insurance, and saving for long-term goals as well as emergencies.

Child care is another important expense to plan for, especially when both parents are working or in school full-time. The cost and availability of such services can be a deciding factor in determining whether parents can pursue their future plans. According to a 2009 report from the National Association of Child Care Resource and Referral Agencies (NACCRRA), day care costs for an infant in the United States range from \$4,560 to \$15,895 a year (\$380 to \$1,325 monthly).

Preconception Care

The birth of a healthy baby depends in part on the mother's overall wellness *before* conception. The U.S. Public Health Service recommends that all women receive health care to help them prepare for pregnancy. **Preconception care** should include an assessment of health risks, the promotion of

QUICK STATS

**Nearly
114,000 babies
were born to
mothers aged 40
and older in 2009.**

—CDC, 2012

preconception care Health care in preparation for pregnancy.

TERMS

healthy lifestyle behaviors, and any treatments necessary to reduce risk. Following are some of the issues, tests, and treatments parents-to-be may encounter in preconception care:

- **Preexisting conditions.** Medical conditions such as diabetes, cardiac and renal disease, epilepsy, asthma, psychiatric disease, and anemia can cause problems during pregnancy. Such conditions should be treated and monitored throughout pregnancy.

- **Medications.** Some medications and dietary supplements harm the **fetus** (the unborn baby from the ninth week after conception to the moment of birth), so a pregnant woman may need to change medications or stop taking certain drugs.

- **Prior pregnancies.** Problems with previous pregnancies or deliveries—such as miscarriage, premature birth, or delivery complications—may be due to treatable physical conditions.

- **Age.** A woman's age may place her at risk for certain problems during pregnancy. A pregnant teenager, for example, may require special nutrition to meet her own growing body's needs and those of her baby. All women should be offered genetic screening and diagnostic testing depending on their risk assessment. Every patient has a baseline risk of 3% of having a fetal anomaly identified.

- **Tobacco, alcohol, and caffeine use.** These substances can harm a developing fetus. Women who smoke and drink should stop before becoming pregnant. Women who are pregnant or trying to conceive should limit their caffeine intake. (See Chapters 9–11 for more information about these and other substances.)

- **Infections.** A woman who has any type of infection should be treated for the infection before getting pregnant. This is good advice for men, too, to avoid transmitting an infection to their partner. A woman may need to be vaccinated against hepatitis B, rubella (German measles), varicella (chicken pox), and other communicable diseases if she is at risk for them. Testing for tuberculosis and some STDs can ensure treatment prior to pregnancy. (See Chapter 17 for more about infectious diseases.)

- **HIV.** Any woman who is at risk of HIV infection should be tested before getting pregnant; her partner should be tested too. If the woman tests positive, she needs to be evaluated and treated, and once she becomes pregnant, she needs to be started (if she hasn't already) on anti-retroviral medications. HIV-positive women who take their medications as directed are able to deliver vaginally. (See Chapter 18 for more about HIV and AIDS.)

fetus The developmental stage of a human from the ninth week after conception to the moment of birth.

TERMS

A woman of childbearing age needs **extra folic acid** to prevent **neural tube defects** in any future children she may have.

- **Diet.** Good nutrition is essential to a healthy pregnancy. Nutritional counseling can help a woman create a plan for healthful eating before and during pregnancy. Diet is especially important for any woman with special nutritional needs or an eating disorder, or who is overweight or obese. Physicians commonly prescribe prenatal vitamin supplements to pregnant women. The U.S. Public Health Service recommends that all women of childbearing age get 400 µg of folic acid from fortified foods and/or supplements each day to reduce the risk of neural tube defects that can arise in the fetus. (See Chapter 12 for more information about nutrition.)

- **Multiple births.** If twins or multiple births run in a woman's family, she is more likely to have multiple births, too. Multiple births are also more prevalent in mothers who are obese, over 40, of African descent, or using certain reproductive technologies (such as in vitro fertilization) to become pregnant.

- **Genetic diseases.** If either partner has a family history of any genetic disease, genetic counseling may be in order before pregnancy. Genetic testing can determine whether the mother or father is a carrier for a specific disease. With counseling, a couple can decide how best to deal with the possibility of transferring a disease to a child. Members of some ethnic groups are at higher risk for genetic disorders; for more information about such disorders, see the box "Ethnicity and Genetic Diseases."

Additional tests or changes in lifestyle may be recommended for prospective parents who have recently traveled outside the United States; work with chemicals, radiation, or toxic substances; participate in physically demanding or hazardous activities or occupations; or face significant psychosocial risks, including homelessness, an unsafe home environment, or mental illness.

UNDERSTANDING FERTILITY

Conception is a complex process. Although many couples conceive easily, others face a variety of difficulties.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

If you don't have children now, do you plan to have them someday? Have you thought about the skills and qualities that make a good parent? Given what you know about yourself today, do you think you will be a good parent? What skills or qualities do you think you need to develop?

DIVERSITY MATTERS

Ethnicity and Genetic Diseases



Genes carry the chemical instructions that determine the development of hundreds of individual traits, including disease risks, in every human being. Many traits and conditions involve multiple genes and environmental influences. Some diseases, however, can be traced to a mutation in a single gene.

Children inherit one set of genes from each parent. If only one copy of an abnormal gene is necessary to produce a disease, it is called a *dominant* gene. Diseases caused by dominant genes seldom skip a generation; anyone who carries the gene will probably get the disease.

If two copies of an abnormal gene (one from each parent) are necessary for a disease to occur, the gene is called *recessive*. Many diseases caused by recessive genes occur disproportionately in certain ethnic groups. Prospective parents who come from the same ethnic group can be tested for recessive diseases that are known to occur in that group. If both parents are carriers, each of their children will have about a 25% chance of developing the disease.

The following list describes a few common conditions with proven genetic links in certain ethnic populations. If there is a history of any of these conditions in your family and you plan to have children, genetic tests and counseling can help assess the risk to your prospective children.

- *Sickle-cell disease* occurs in about 1 out of every 500 African American births and in 1 out of every 36,000 Hispanic American births, according to the CDC. In this disease, red blood cells, which carry



oxygen to the body's tissues, change shape; the normally disc-shaped cells become sickle-shaped. The altered cells carry less oxygen and can block small blood vessels. People who inherit one gene for sickle-cell disease (about 1 in 12 African Americans) experience only mild symptoms; those with two genes become severely, often fatally, ill.

If you are at risk for sickle-cell disease, you should take care to reduce stress and respond to minor infections because red blood cells become sickle-shaped when the body is under stress. You should also have regular checkups and appropriate treatment, if required.

- *Hemochromatosis* ("iron overload") affects about 1 in 200 people. At highest risk are people of Northern European (especially Irish), Mediterranean, and Hispanic descent. In hemochromatosis, the body absorbs and stores up to 10 times the normal amount of iron. Iron deposits form in the joints, liver, heart, and pancreas. If untreated, the disease can cause organ failure and death.

Early symptoms are often vague and include weakness, lethargy, darkening of the skin, and joint pain. Early detection and treatment are necessary to prevent damage. Treatment involves reducing iron stores by removing blood from the body (a process known as phlebotomy or "bloodletting").

- *Tay-Sachs disease*, another recessive disorder, occurs in about 1 in 3000 Jews of Eastern European ancestry. People with Tay-Sachs disease cannot properly metabolize fat. As a result, the brain and other nerve tissues deteriorate. Affected children show weakness in their movements and eventually develop blindness (by age 12–18 months) and seizures. This disease is fatal, and death usually occurs by age 6. No effective treatment is currently available.
- *Cystic fibrosis* affects 1 in 2500–3000 Caucasians; about 1 in 29 carries one copy of the cystic fibrosis gene. In cystic fibrosis, essential pancreatic enzymes are deficient so the body cannot properly absorb nutrients. Thick mucus impairs functioning in the lungs and intestinal tracts of people with this disease. Cystic fibrosis is often fatal in early childhood, but treatments are increasingly effective in reducing symptoms and prolonging life. In some cases, symptoms do not appear until early adulthood.

- *Thalassemia* is a blood disease found most often among Italians, Greeks, and to a lesser extent African Americans and Asians. When inherited from one parent, this form of anemia is mild; when two genes are present, the disease is severe and can cause fetal death.

Children with this condition require repeated blood transfusions, eventually resulting in a damaging iron buildup. New interventions—such as genetic engineering, bone marrow transplants, and chemicals that bind excess iron and remove it from the body—offer promise. Stem cell transplants from the umbilical cord blood of an unaffected sibling or donor are being used in some cases.

If you are at risk of carrying thalassemia, you should get regular checkups and monitor your health for symptoms, and learn ways to manage symptoms if they start to occur.

- *Canavan disease* or aspartoacylase deficiency was first identified in the early 1900s and causes a spongy degeneration of myelin in infancy. Ashkenazi Jews have a higher prevalence of being carriers of Canavan disease. The condition presents by approximately 3 months of age and causes loss of muscle tone, which progresses to spasticity and seizures. Several treatments are under investigation, but most cases are treated with supportive care. Most children with Canavan disease die by age 5.

- *Familial dysautonomia*, a progressive sensorimotor neuropathy, is seen in 1/3700 Ashkenazi Jews. Clinically, infants show signs of decreased muscle tone and poor feeding with development of chronic lung disease and reflux. Those affected further develop hypertension. Treatment involves supportive and symptomatic therapies.

- *Fanconi's anemia* is characterized by congenital anomalies and progressive bone marrow failure. The general population has a carrier frequency of 1/300; however, the carrier frequency is 1/89 in the Ashkenazi Jewish population. Treatment involves stem cell transplantation, which is becoming more successful as technology advances. The median survival time is to 16–23 years of age, at which time patients develop overwhelming infection or suffer hemorrhage.

connect
ACTIVITY
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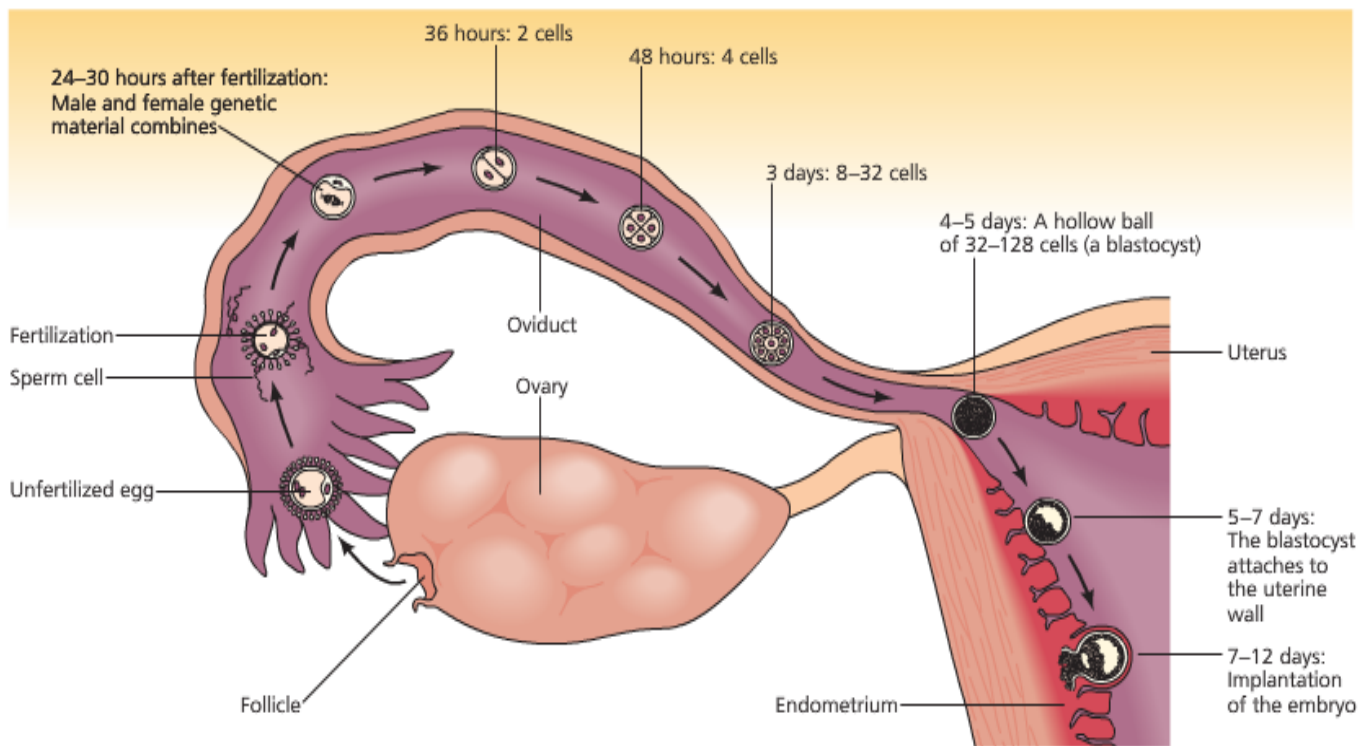


FIGURE 8.1 Fertilization and early development of the embryo.

Conception

The process of conception involves the **fertilization** of a woman's ovum (egg) by a man's sperm (Figure 8.1). Every month during a woman's fertile years, her body prepares itself for conception and pregnancy. In one of her ovaries, an egg matures and is released from its follicle. The egg, about the size of a pinpoint, travels through an oviduct, or fallopian tube, to the uterus in three to four days. The endometrium, or lining of the uterus, has already thickened for the implantation of a **fertilized egg**, or **zygote**. If the egg is not fertilized, it lasts about 24 hours and then disintegrates. The woman's body then expels the egg's remains and the uterine lining during menstruation.

Fertilization Sperm cells are produced in the man's testes and ejaculated from his penis into the woman's vagina during sexual intercourse (except in cases of artificial insemination or assisted reproduction; see the section "Treating Infertility"). Sperm cells are much smaller than eggs. The typical ejaculate contains millions of sperm, but only a few complete the journey through the uterus and up the fallopian tube to the egg. Many sperm cells do not survive in the vagina's acidic environment.

Once through the cervix and into the uterus, many sperm cells are diverted to the wrong oviduct or get stuck along the way. Of those that reach the egg, only one will penetrate its hard outer layer. As sperm approach the egg, they release enzymes that soften this outer layer. Enzymes from hundreds of sperm must be released in order for the egg's outer layer to soften enough to allow one sperm cell to penetrate. The first sperm cell that bumps into a spot that is soft enough can

swim into the egg cell. It then merges with the nucleus of the egg, and fertilization occurs. The sperm's tail, its means of locomotion, gets stuck in the egg's outer membrane and drops off, leaving the sperm's head inside the egg. The egg then releases a chemical that makes it impenetrable by other sperm.

The ovum carries the hereditary characteristics of the mother and her ancestors; sperm cells carry the hereditary characteristics of the father and his ancestors. Each parent cell—egg or sperm—contains 23 chromosomes, each of which contains **genes**, which are packages of chemical instructions for the developing baby. Genes provide the blueprint for a unique individual based on the functional and health characteristics of his or her ancestors (see the box "Creating a Family Health Tree").

Upon fertilization, the zygote starts to undergo cell division and the growth process begins. The zygote continues to divide as it travels through the oviduct to the uterus. When it reaches the uterus, the cluster of 32–128 cells (now called a **blastocyst**) attaches to the uterine wall. Soon it becomes implanted in the endometrium and becomes an embryo.

fertilization The initiation of biological reproduction; the union of the nucleus of an egg cell with the nucleus of a sperm cell.

fertilized egg The egg after penetration by a sperm; a *zygote*.

gene The basic unit of heredity; a section of a chromosome containing chemical instructions for making a particular protein.

TERMS

ASSESS YOURSELF

Creating a Family Health Tree



The genetic inheritance that each of us receives from our parents—and that our children receive from us—contains more than just physical characteristics, such as eye and hair color. Heredity also contributes to our risk of developing certain diseases and disorders. For certain uncommon illnesses such as hemophilia and sickle-cell disease, heredity is the primary cause; if your parents pass on the necessary genes, you'll get the disease. But heredity plays a subtler role in many other diseases, which are caused at least in part by environmental influences such as infection, cancer-causing chemicals, and physical inactivity. Although your genes alone will not produce those diseases, they can determine how susceptible you are. Researchers have found a genetic influence in many common disorders, including heart disease, diabetes, depression, asthma, alcoholism, and certain forms of cancer.

Knowing that a specific disease runs in your family allows you to seek out early screening, which can greatly affect your long-term health. Changing health habits can be valuable for people with a family history of certain diseases. For example, an individual with a family history of high cholesterol and early heart disease can increase physical activity and pay special attention to diet.

In general, the more first-degree relatives you have with a genetically transmitted disease, the greater your risk. However, non-genetic factors—such as health habits—can also play a role. Signs of strong hereditary influence include early onset of a disease, appearance of the disease largely or exclusively on one side of the family, onset of the same disease at the same age in more than one relative, and developing the disease despite good health habits.

You can put together a simple family health tree by compiling a few key facts about your primary relatives: siblings, parents, aunts and uncles, and grandparents. Those facts include the dates of birth, major diseases, health-related conditions and habits, and, for deceased relatives, the ages at death as well as the

causes. Because certain diseases are more common in particular ethnic groups, also record the ethnic background of each grandparent. Next create a tree, using the example below as a guide. Then show your tree to a physician or genetic counselor, who can help you target the health behaviors and screening tests that are most important for you and help you determine whether genetic testing might be appropriate.

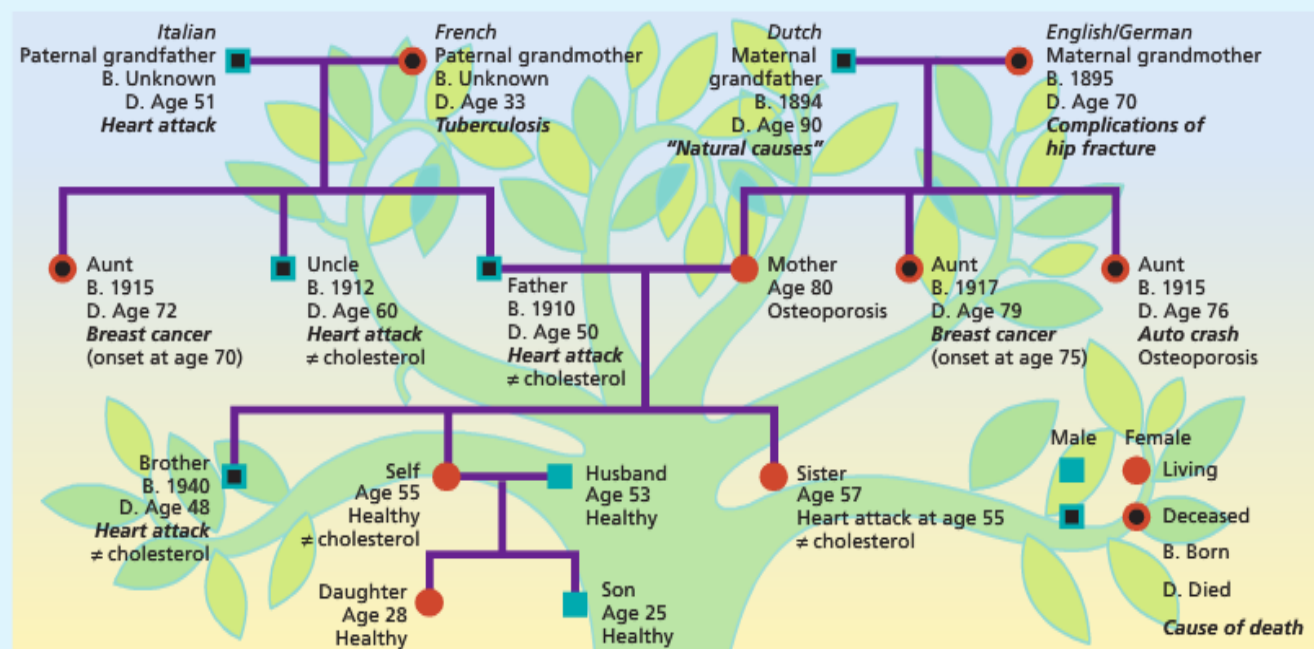
A Sample Family Health Tree and What It Means

The 55-year-old woman who prepared this family tree has a strong family history of osteoporosis on her mother's side. Based on this, her physician may suggest a bone density test to help gauge her risk and recommend bone-healthy lifestyle changes. She also has several close relatives on her father's side of the family who had high cholesterol levels and had heart attacks at early ages. These risk factors significantly increase her chance of having a heart attack.

The woman has two aunts who died of breast cancer, but there are several reasons not to be overly concerned. Aunts are second-degree relatives, more distantly related to her than her mother or sister (first-degree relatives). In addition, they came from different sides of the family, and they developed the disease quite late in life. Given these factors, it is likely that these cases of breast cancer did not have a significant genetic origin.

Looking at her family history can help this woman make important decisions about behaviors such as moderate alcohol consumption, which may lower the risk of heart attack but which may also slightly increase the risk of breast cancer. Based on her family history, her physician may recommend bone density testing to determine her risk of dangerous fractures and recommend medication and a heart-healthy diet to reduce her unhealthy cholesterol level and overall heart attack risk.

SOURCES: From "Prepare for the Future: Know Your Ancestors" and "Creating a Family Health Tree" © 1999 by Consumers Union of U.S., Inc. Yonkers, NY 10703-1057, a nonprofit organization. Reprinted with permission from the September 1999 Issue of *Consumer Reports on Health*® for educational purposes only. www.ConsumerReports.org.



Twins In the usual course of events, one egg and one sperm unite to produce one fertilized egg and one baby. But if the ovaries release two or more eggs during ovulation and if both eggs are fertilized, twins develop. The development of two or more fetuses in the same pregnancy is called *multiple gestation* and leads to a *multiple birth*. These twins will be no more alike than siblings from different pregnancies because each will have come from a different fertilized egg. Twins who develop this way are referred to as **fraternal twins (dichorionic/diamniotic)**; they may be the same sex or different sexes. About 70% of twins are fraternal.

Twins can also develop from the division of a single fertilized egg into two cells that develop separately. Because these babies share all genetic material, they will be **identical twins (monochorionic/monoamniotic or diamniotic)**.

The most serious complication of multiple births is preterm delivery (delivery before the fetuses are adequately mature). The higher the number of fetuses that a woman carries, the earlier in gestation she will deliver. This leads to higher rates of complications due to prematurity.

Infertility

About 2 million American couples have difficulty conceiving. **Infertility** is defined as the inability to conceive after trying for a year or more. Infertility affected about 7.4% of reproductive-aged American women (15–44 years) in the United States in 2002 (the most recent year for which reliable statistics are available). Over 1 million women seek treatment for infertility each year. Although the focus is often on women (where the cause of infertility is found in 50% of cases), 26% of the factors contributing to infertility are male, and in 35% of infertile couples, both partners have problems. Therefore, it is important that both partners be evaluated.

Female Infertility Female infertility usually results from one of two key causes—tubal blockage (14%) or failure to ovulate (21%). An additional 37% of cases of infertility are due to anatomical abnormalities, benign growths in the uterus, thyroid disease, and other uncommon conditions; the remaining 28% of cases are unexplained.

Blocked fallopian tubes are most commonly the result of *pelvic inflammatory disease (PID)*, a serious complication of several sexually transmitted diseases. One study found that out of 100,000 women aged 20–24 who were diagnosed with PID, 16,800 went on to have problems with infertility. Most cases of PID are associated with untreated cases of chlamydia or gonorrhea. More than 2.5 million cases of PID are treated each year, but physicians estimate that just as many may go untreated because of an absence of symptoms. Tubal blockages can also be caused by prior surgery or by *endometriosis*, a condition in which endometrial (uterine) tissue grows outside the uterus. This tissue responds to hormones and can cause pelvic pain, bleeding, scarring, and adhesions. Endometriosis is typically treated with hormonal therapy and surgery.

Age also impacts fertility. Beginning around age 30, a woman's fertility naturally begins to decline. Age is probably the main

factor in ovulation failure. Exposure to toxic chemicals or radiation also appears to reduce fertility, as does cigarette smoking.

Male Infertility Male factor infertility accounts for about 26% of infertile couples. The leading causes of male infertility can be divided into four main categories: hypothalamic pituitary disease (1–2%), testicular disease (30–40%), disorders of sperm transport or posttesticular disorders (10–20%), and unexplained (40–50%). Some acquired disorders of the testes can lead to infertility, such as damage from the following causes:

- Drug use (large doses of marijuana, for example, cause lower sperm counts and suppress certain reproductive hormones)
- Radiation
- Infection (such as having had mumps as a child)
- Environmental toxins
- Hyperthermia
- Smoking

Treating Infertility The cause of infertility can be determined for about 85% of infertile couples. Most cases of infertility are treated with conventional medical therapies. Surgery can repair oviducts, remove endometriosis, and correct anatomical problems in men and women. Fertility drugs can help women ovulate, but may cause multiple births. If these conventional treatments don't work, couples can turn to **assisted reproductive technology (ART)** techniques, as described in the following sections. According to 2010 estimates from the CDC, about 1–3% of births in the United States and Europe are the result of ART treatments.

Most infertility treatments are expensive and emotionally draining, and their success is hard to predict. Some infertile couples choose not to try to have children, whereas others turn to adoption. One measure you can take to avoid infertility is to protect yourself against STIs and get prompt treatment for any disease you contract. Couples who are ready should consider trying to conceive prior to the woman's late 30s to decrease the probability of age-related infertility.

INTRAUTERINE INSEMINATION Male infertility can sometimes be overcome by collecting and concentrating the man's sperm and introducing it by syringe into a woman's vagina or

fraternal (dichorionic/diamniotic)

twins Twins who develop from separate fertilized eggs; such twins are not genetically identical.

identical (monochorionic/monoamniotic or diamniotic)

twins Twins who develop from the division of a single zygote; such twins are genetically identical.

infertility The inability to conceive after trying for a year or more.

assisted reproductive technology (ART) Advanced medical techniques used to treat infertility.

TERMS

uterus, a procedure known as **artificial (intrauterine) insemination**. To increase the probability of success, the woman is often given fertility drugs to induce ovulation prior to the insemination procedure. The sperm can be provided by the woman's partner or a donor. Donor sperm are also used by single women and lesbian couples who want to conceive using artificial insemination. The success rate is about 5–20%. The wide range is due to age-related influences.

IVF, GIFT, AND ZIFT Three related techniques for overcoming infertility involve surgically removing mature eggs from a woman's ovary:

- In **in vitro fertilization (IVF)**, the harvested eggs are mixed with sperm in a laboratory dish. If eggs are successfully fertilized, one or more of the resulting embryos are inserted into the woman's uterus. IVF is often used by women with blocked oviducts.
- In **gamete intrafallopian transfer (GIFT)**, eggs and sperm are surgically placed into the fallopian tubes prior to fertilization.
- In **zygote intrafallopian transfer (ZIFT)**, eggs are fertilized outside the woman's body and surgically introduced into the oviducts after they begin to divide.

GIFT and ZIFT can be used by women who have at least one open fallopian tube.

There are disadvantages to IVF. Success rates determined by live birth rates vary from about 5.1% to 41.1% depending on age. It costs more than \$10,000 per procedure and may require five or more attempts to produce one live birth. It also increases the chance of multiple births, which in turn increases the risk of premature birth and maternal complications, including pregnancy-related hypertension and diabetes.

GESTATIONAL CARRIER (FORMERLY KNOWN AS SURROGACY) A gestational carrier (GC) is a fertile woman who agrees to carry a fetus for an infertile couple. The GC agrees to be artificially inseminated by the father's sperm or to undergo IVF with the couple's embryo, to carry the baby to term, and to give it to the couple at birth. In return, the couple

pays her for her services (typically around \$50,000). There are thought to be approximately 1000 gestational carrier pregnancies each year in the United States.

Emotional Responses to Infertility Couples who seek treatment for infertility have often already confronted the possibility of not being able to become biological parents. Many infertile couples feel they have lost control over a major facet of their lives. They may lose perspective on the rest of their lives as they focus more and more on the reasons for their infertility and on treatment. Infertile couples may need to set their own limits on how much treatment they are willing to undergo.

Support groups for infertile couples can provide help in this difficult situation, but there are few easy answers to infertility. If treatment is unsuccessful, couples must mourn the loss of the children they will never bear. They need to make a decision about their future—whether to pursue plans for adoption or further treatment, or to adjust to childlessness and go on with their lives.

QUICK STATS

146,244 ART procedures were performed in the United States in 2009, resulting in more than 45,870 babies.

—CDC, 2011

PREGNANCY

Pregnancy is usually discussed in terms of **trimesters**—three periods of about three months (or 13 weeks) each. During the first trimester, the mother experiences a few physical changes and some fairly common symptoms. During the second trimester, often the most peaceful time of pregnancy, the mother gains weight, looks noticeably pregnant, and may experience a general sense of well-being if she is happy about having a child. The third trimester is the hardest for the mother because she must breathe, digest, excrete, and circulate blood for herself and the growing fetus. The weight of the fetus, the pressure of its body on her organs, and its increased demands on her system cause discomfort and fatigue and may make the mother increasingly impatient to give birth.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your views on infertility treatments? Do you feel treatment is appropriate, or do you think infertile couples should adopt children? If you were faced with a diagnosis of infertility, what would you consider doing?

artificial (intrauterine) insemination The introduction of semen into the vagina by artificial means.

in vitro fertilization (IVF) Combining eggs and sperm outside the body and inserting one or more fertilized eggs into the uterus.

gamete intrafallopian transfer (GIFT) Surgically placing eggs and sperm in the fallopian tube prior to fertilization.

zygote intrafallopian transfer (ZIFT) Surgically placing a fertilized egg into the fallopian tube.

trimester One of the three 3-month periods of pregnancy.

TERMS



CRITICAL CONSUMER

Home Pregnancy Tests

Women have access to a variety of over-the-counter home pregnancy tests today; but generally speaking, these tests all work in the same way to determine whether a woman is pregnant. Pregnancy tests are designed to detect the presence of the hormone *human chorionic gonadotropin (HCG)*, which is discussed in this chapter. Because the placenta releases HCG, the hormone can be detected in the urine or blood when a woman is pregnant.

Home pregnancy tests have become extremely accurate since their introduction in 1975. In a 2001 study, researchers found that the highest possible screening sensitivity for an HCG-based pregnancy test is 90% when taken on the first day of a missed period. In 10% of women, the fertilized egg may not have implanted in the uterine wall by the first day of a missed period. The researchers estimated that when taken seven days after the first day of a missed period, the highest possible screening sensitivity of a home pregnancy test is 97%. The typical test provides accurate results 99% of the time.

There generally are two types of home pregnancy tests—those that require that the test strip be dipped into urine, and those that require the user to urinate directly on the test strip. Different tests use different mechanisms to display test results. Some use symbols such as a + or – sign, some spell out the words “pregnant” and “not pregnant,” and others utilize a color scheme.

Using the most sensitive pregnancy tests, the earliest you can get a positive result is seven days after ovulation. Implantation

needs to occur before HCG is produced, and that generally happens 6–12 days after ovulation, usually by 10 days after. For this reason, it makes economic sense to wait until 10–12 days after ovulation, but even then a significant percentage of women who actually are pregnant will still show a negative result. HCG levels should double every two to three days, and many women won’t have a positive test result until the first day of a missed period or even a few days later.

A clinical blood test is more accurate but not necessarily more sensitive than a home pregnancy test. A quantitative blood test, usually called a *beta HCG test*, measures the exact number of units of HCG in the blood. This type of test can detect even the most minimal level. Labs vary in what is considered a positive pregnancy test. Common cutoffs for positive are 5, 10, and 25 units. A level under 5 is considered negative.

Women need to use home pregnancy test kits with a clear understanding of their limitations. If you’re comfortable waiting, a sensitive test taken a week after your period is due will almost certainly give you accurate results. If you elect to take the test as early as the day after you’ve missed your period, remember that a negative result isn’t 100% certain. A positive result may mean either a viable pregnancy or a pregnancy destined to end shortly after it began. With either of those results, you should plan on testing again a week later, just to be sure. For that reason, it’s a good idea to buy tests in pairs; 15 of the 18 commercially available home testing products come in multiple-test kits.

Pregnancy Tests

The earliest tests for pregnancy are chemical tests designed to detect the presence of **human chorionic gonadotropin (HCG)**, a hormone produced by the implanted fertilized egg. These tests may be performed as early as two weeks after fertilization.

Home pregnancy test kits, which are sold without a prescription in drugstores, include a small sample of red blood cells coated with HCG antibodies, to which the woman adds a small amount of her urine. If the concentration of HCG is great enough, it will clump together with the HCG antibodies, indicating that the woman is pregnant. Home pregnancy tests can be very reliable, but the instructions must be followed carefully. If a home test done at the time of a missed menstrual period is negative, retesting after another week is

recommended. In the first day or two following a missed period, the concentration of HCG may be too low to be detected by the test (see the box “Home Pregnancy Tests”).

Changes in the Woman’s Body

Hormonal changes begin as soon as the egg is fertilized, and for the next nine months the woman’s body nourishes the fetus and adjusts to its growth (Figure 8.2).

Early Signs and Symptoms Early recognition of pregnancy is important, especially for women with physical problems and nutritional deficiencies. The following symptoms are not absolute indications of pregnancy, but they are reasons to visit a gynecologist:

- **A missed menstrual period.** When a fertilized egg implants in the uterine wall, the endometrium is retained to nourish the embryo. A woman who misses a period after having intercourse may be pregnant.
- **Slight bleeding.** Slight bleeding follows implantation of the fertilized egg in about 14% of pregnant women.

human chorionic gonadotropin (HCG) A hormone produced by the fertilized egg that can be detected in the urine or blood of the mother shortly after conception.

TERMS

Because this happens about when a period is expected, the bleeding is sometimes mistaken for menstrual flow. It usually lasts only a few days.

- **Nausea.** About 50–90% of pregnant women feel some level of nausea, probably as a reaction to increased levels of progesterone and other hormones. Although this nausea is often called *morning sickness*, some women have it all day long. It frequently begins during the 6th week and disappears by the 12th week. In some cases it lasts throughout the pregnancy.
- **Breast tenderness.** Some women experience breast tenderness, swelling, and tingling, usually described as different from the tenderness experienced before menstruation.
- **Increased urination.** Increased frequency of urination can occur soon after the missed period.
- **Sleepiness, fatigue, and emotional upset.** These symptoms result from hormonal changes. Fatigue can be surprisingly overwhelming in the first trimester but usually improves significantly around the third month of pregnancy.

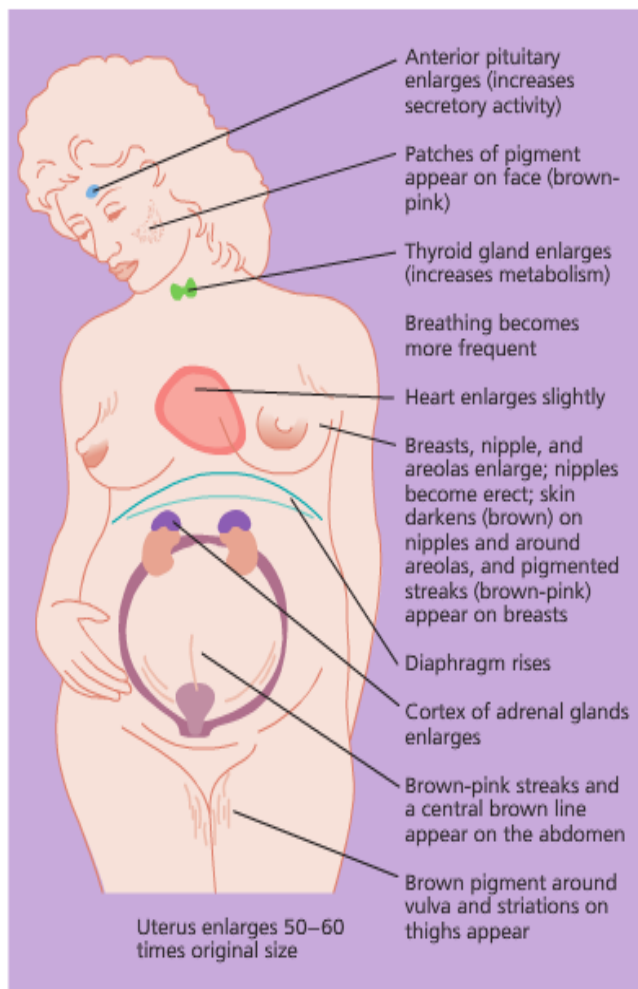


FIGURE 8.2 Physiological changes during pregnancy.

The first reliable physical signs of pregnancy can be distinguished about four weeks after a woman misses her menstrual period. A softening of the uterus just above the cervix, called *Hegar's sign*, and other changes in the cervix and pelvis are apparent during a pelvic examination. The labia minora and the cervix may take on a purple color rather than their usual pink hue.

Four weeks after a woman misses her menstrual period, she is considered to be about eight weeks pregnant because pregnancy is calculated from the time of a woman's last menstrual period rather than from the time of actual fertilization. (The timing of ovulation and fertilization is often difficult to determine.) Although a woman should see her physician to determine her due date, due dates can be approximated by subtracting three months from the date of the last menstrual period and then adding seven days. For example, a woman whose last menstrual period began on September 20th would have a due date of about June 27th.

Continuing Changes in the Woman's Body The most obvious changes during pregnancy occur in the reproductive organs. During the first three months, the uterus enlarges to about three times its nonpregnant size, but it still cannot be felt in the abdomen. By the fourth month, it is large enough to make the abdomen protrude. By the seventh or eighth month, the uterus pushes up into the rib cage, which makes breathing slightly more difficult. The breasts enlarge and are sensitive; by week 8, they may tingle or throb. The pigmented area around the nipple, called the *areola*, darkens and broadens.

Other changes are going on as well. Early in pregnancy, the muscles and ligaments attached to bones begin to soften and stretch. The joints between the pelvic bones loosen and spread, making it easier to have a baby but harder to walk. The circulatory system becomes more efficient to accommodate higher blood volume, which increases by 50%, and the heart pumps it more rapidly. Much of the increased blood flow goes to the uterus and placenta (the organ that exchanges nutrients and waste between mother and fetus). The mother's lungs also become more efficient, and her rib cage widens to permit her to inhale up to 40% more air. Much of the oxygen goes to the fetus. The kidneys become highly efficient, removing waste products from fetal circulation and producing large amounts of urine by midpregnancy.

The average weight gain during a healthy pregnancy is 27.5 pounds, although actual weight change varies with the individual. Table 8.1 shows the weight gains recommended

Table 8.1 Recommended Weight Gain during Pregnancy

STATUS (BMI)	WEIGHT GAIN (POUNDS)
Underweight (<18.5)	28–40
Normal (18.5–24.9)	25–35
Overweight (25–29.9)	15–25
Obese (>30)	11–20

by the Institute of Medicine in 2009 based on a woman's prepregnancy weight status. About 60% of the weight gain is directly related to the baby (such as the fetus and placenta); the rest accumulates over the woman's body as fluid and fat.

As the woman's skin stretches, small breaks may occur in the elastic fibers of the lower layer of skin, producing *stretch marks* on her abdomen, hips, breasts, or thighs. Increased pigment production darkens the skin in 90% of pregnant women, especially in places that have stretched.

Changes during the Later Stages of Pregnancy By the end of the sixth month, the increased needs of the fetus place a burden on the mother's lungs, heart, and kidneys. Her back may ache from the pressure of the baby's weight and from having to throw her shoulders back to keep her balance while standing (Figure 8.3). Her body retains more water, perhaps up to three extra quarts of fluid. Her legs, hands, ankles, or feet may swell, and she may be bothered by leg cramps, heartburn, or constipation. Despite discomfort, both her digestion and her metabolism are working at top efficiency.

The uterus prepares for childbirth with preliminary contractions, called *Braxton Hicks contractions*. Unlike true labor contractions, these are usually short, irregular, and painless. The mother may only be aware that at times her abdomen is hard to the touch. These contractions become more frequent and intense as the delivery date approaches.

In the ninth month, the baby settles into the pelvic bones, usually head down, fitting

snugly. This process, called **lightening**, allows the uterus to sink down about two inches, producing a visible change in the mother's profile. Pelvic pressure increases, and pressure on the diaphragm lightens. Breathing becomes easier; urination becomes more frequent. Sometimes, after a first pregnancy, the baby doesn't settle down into the pelvis until labor begins.

Emotional Responses to Pregnancy

Rapid changes in hormone levels can cause a pregnant woman to experience unpredictable emotions. A large part of pregnancy is beyond the woman's control—her changing appearance, her energy level, her variable moods—and some women need extra support and reassurance to stay on an even keel. Hormonal changes can also make women feel exhilarated and euphoric, although for some women such moods are temporary.

Like the physical changes that accompany pregnancy, emotional responses also change as the pregnancy develops. During the first trimester, the pregnant woman may fear that she may miscarry or that the child will not be normal. Education about pregnancy and childbirth and support from her partner, friends, relatives, and health care professionals are important antidotes to these fears.

During the second trimester, the pregnant woman can feel the fetus move within her, and worries about miscarriages usually begin to diminish. She may look and feel happy and be delighted as her pregnancy begins to show. However, she may also worry that her increasing size makes her unattractive. Reassurance from her partner can ease these fears.

The third trimester is the time of greatest physical stress during the pregnancy. A woman may find that her physical abilities are limited by her size. Because some women feel physically awkward and sexually unattractive, they may experience periods of depression. But many also feel a great deal of happy excitement and anticipation. The fetus may already be looked on as a member of the family, and both parents may begin talking to the fetus and interacting with it by patting the mother's belly. The upcoming birth will probably be a focus for both the woman and her partner.

Fetal Development

Now that we've seen what happens to the mother's body during pregnancy, let's consider the development of the fetus (Figure 8.4).

QUICK

STATS

Up to 20% of women have symptoms of depression during pregnancy.

—March of Dimes Foundation, 2011

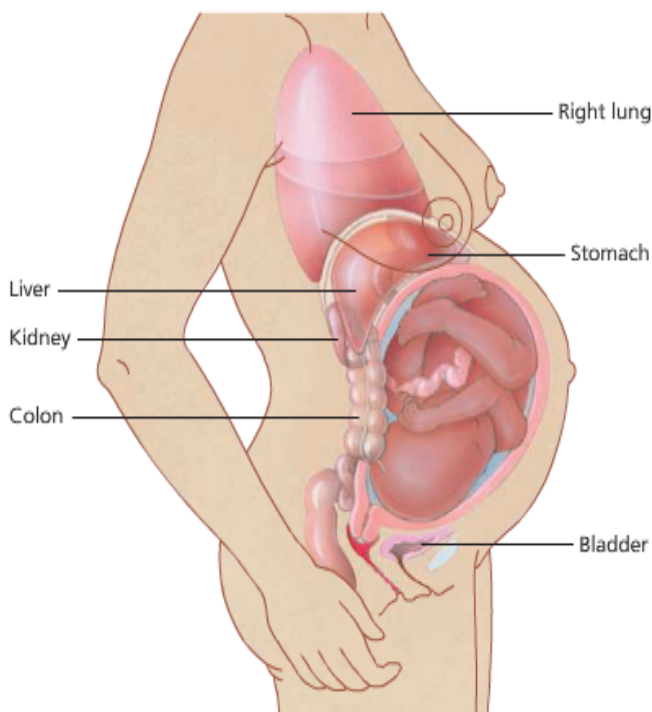


FIGURE 8.3 The fetus during the third trimester of pregnancy.

lightening A process in which the uterus sinks down because the baby's head settles into the pelvic area.

TERMS

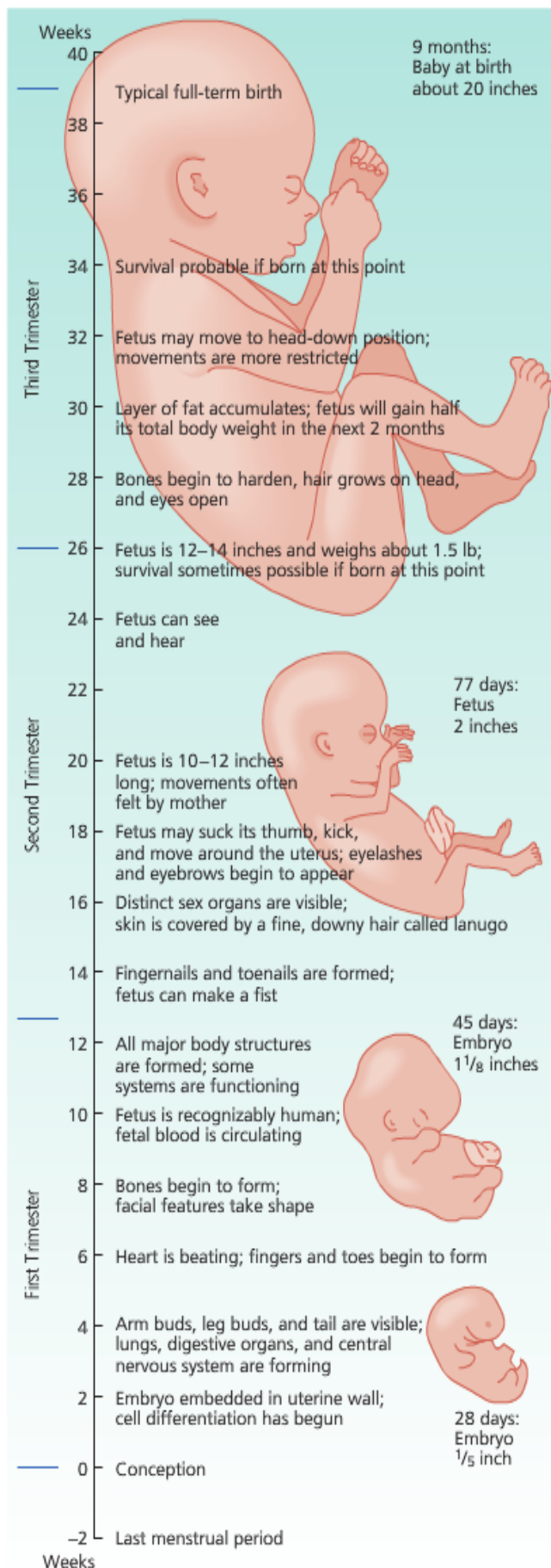


FIGURE 8.4 A chronology of milestones in prenatal development.

The First Trimester About 30 hours after an egg is fertilized, the cell divides, and this process of cell division repeats many times. As the cluster of cells drifts along the oviduct, several different kinds of cells emerge. The entire set of genetic instructions is passed to every cell, but each cell follows only certain instructions; if this were not the case, there would be no different organs or body parts. For example, all cells carry genes for hair color and eye color, but only the cells of the hair follicles and irises (of the eye) respond to that information. This process of individual cells developing into specific organs and structures is called *differentiation*.

On about the fourth day after fertilization, the cluster, now about 32–128 cells and hollow, arrives in the uterus; this is a **blastocyst**. On about the sixth or seventh day, the blastocyst attaches to the uterine wall, usually along the upper curve. Over the next few days, it becomes firmly implanted and begins to draw nourishment from the endometrium, the uterine lining.

The blastocyst becomes an **embryo** by about the end of the second week after fertilization. The inner cells of the blastocyst separate into three layers. One layer becomes inner body parts—the digestive and respiratory systems; the middle layer becomes muscle, bone, blood, kidneys, and sex glands; and the third layer becomes the skin, hair, and nervous tissue.

The outermost shell of cells becomes the **placenta**, **umbilical cord**, and **amniotic sac** (Figure 8.5). A network of blood vessels called *chorionic villi* eventually forms the placenta. The human placenta allows a two-way exchange of nutrients and waste materials between the mother and the fetus. The placenta brings oxygen and nutrients to the fetus and transports waste products out. The placenta does not provide a perfect barrier between the fetal circulation and the maternal circulation, however. Some blood cells are exchanged, and certain substances, such as alcohol, pass freely from the maternal circulation through the placenta to the fetus.

The period between weeks 2 and 9 is a time of rapid differentiation and change. All the major body structures are formed during this time, including the heart, brain, liver, lungs, and sex organs. The eyes, nose, ears, arms, and legs also appear.

blastocyst A stage of development, days 6–14, before the cell cluster becomes the embryo and placenta.

embryo The stage of development between blastocyst and fetus; about weeks 2–8.

placenta The organ through which the fetus receives nourishment and empties waste via the mother's circulatory system; after birth, the placenta is expelled from the uterus.

umbilical cord The cord connecting the placenta and fetus, through which nutrients pass.

amniotic sac A membranous pouch enclosing and protecting the fetus; also holds amniotic fluid.

TERMS

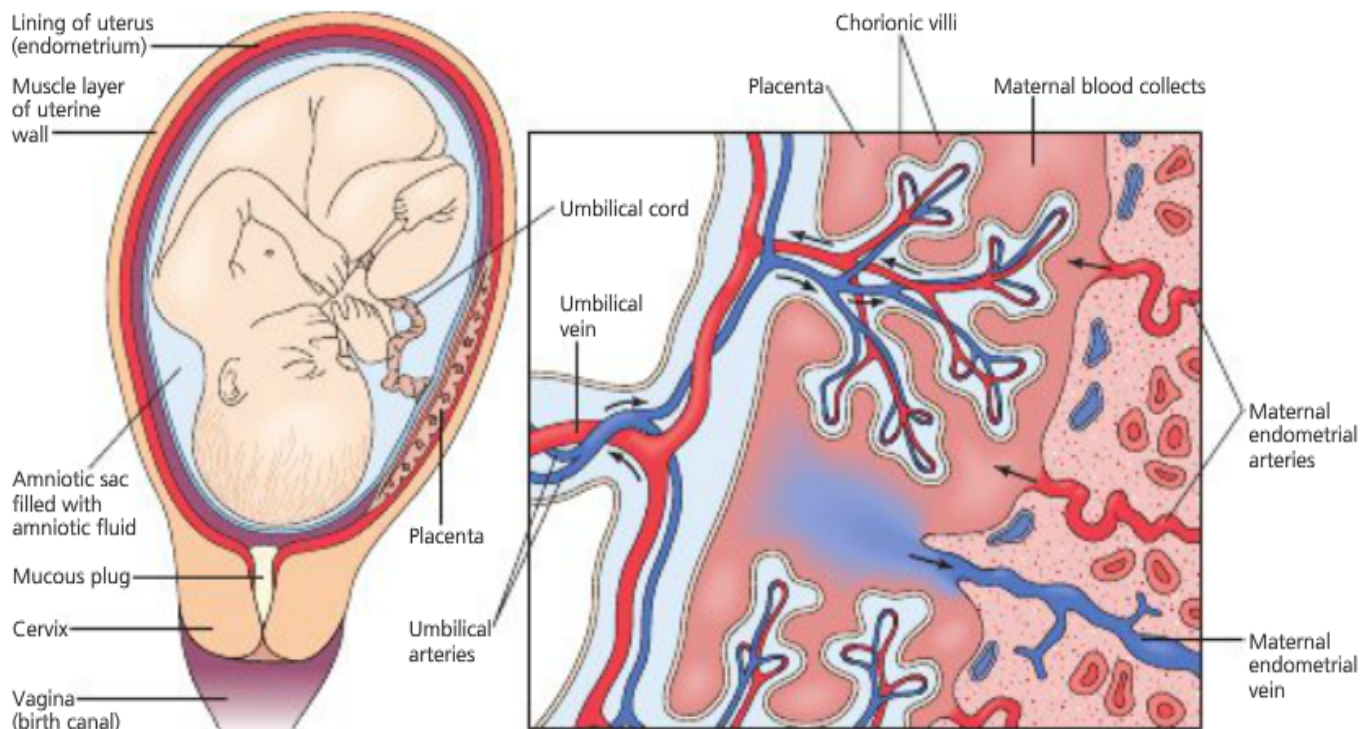


FIGURE 8.5 A cross-sectional view of the fetus in the uterus and an enlargement of the placenta.

Some organs begin to function, as well; the heart begins to beat, and the liver starts producing blood cells. Because body structures are forming, the developing organism is vulnerable to damage from environmental influences such as drugs and infections (discussed in detail in sections that follow).

By the end of the second month, the brain sends out impulses that coordinate the functioning of other organs. The embryo is now a fetus, and most further changes will be in the size and refinement of working body parts. In the third month, the fetus becomes active. By the end of the first trimester, the fetus is about an inch long and weighs less than one ounce.

The Second Trimester To grow during the second trimester, to about 14 inches and 1.5 pounds, the fetus must have large amounts of food, oxygen, and water, which come from the mother through the placenta. All body systems are operating, and the fetal heartbeat can be heard with a stethoscope. The mother can detect fetal movements beginning in the fourth or fifth month. Against great odds, a fetus born at 24–26 weeks (the end of the second trimester) has a 50–60% chance of survival.

The Third Trimester The fetus gains most of its birth weight during the last three months of the pregnancy. Some of the weight is fat under the skin that insulates the fetus and supplies food. About 85% of the calcium and iron the mother consumes goes into the fetal bloodstream.

The fetus may live if it is born during the seventh month, but it needs the fat layer acquired in the eighth month and time for organs—especially the respiratory and digestive



By the fourth month, the fetus is growing rapidly and is about 10 inches long. Weighing about six ounces, it moves vigorously in the uterus and can suck its thumb, frown, and turn its head.

organs—to develop. It also needs the immunity supplied by the antibodies in the mother's blood during the final three months. The antibodies protect the fetus against many of the diseases to which the mother has acquired immunity.

Diagnosing Fetal Abnormalities

About 3% of babies are born with a major birth defect. Information about the health and sex of a fetus can be obtained prior to birth through prenatal testing.

Ultrasonography (also called *ultrasound*) uses high-frequency sound waves to create a **sonogram**, or visual image, of the fetus in the uterus. Sonograms show the fetus's position, size, and gestational age, and the presence of certain anatomical problems. Sonograms can sometimes be used to determine the sex of the fetus. Sonograms are considered safe for a pregnant woman and the fetus, but the FDA advises against “keepsake” sonograms performed for no medical purpose.

Amniocentesis involves the removal of fluid from the uterus with a long, thin needle inserted through the abdominal wall. It is usually performed between 16 and 18 weeks into the pregnancy. A genetic analysis of the fetal cells in the fluid can reveal the presence of chromosomal disorders, such as Down syndrome, and some genetic diseases, including Tay-Sachs disease. The sex of the fetus can also be determined. Most amniocentesis tests are performed on pregnant women over age 35, who have a greater risk of *aneuploidy* (an abnormal number of chromosomes in the fetus), or in cases where the fetus is known to be at risk for a particular chromosomal or genetic defect. Amniocentesis carries a slight risk (a 0.3–0.7% chance of miscarriage).

Another prenatal test is **chorionic villus sampling (CVS)**, which can be performed earlier in pregnancy than amniocentesis, between weeks 10 and 12. This procedure involves removal through the cervix (by catheter) or abdomen (by needle) of a tiny section of chorionic villi, which contain fetal cells that can be analyzed. When CVS first became available, it was associated with a higher risk of miscarriage than amniocentesis, but by 2003 the two procedures were found to be equally safe.

The **quadruple marker screen (QMS)** is a maternal blood test that can be used to help identify fetuses with neural tube

defects, Down syndrome, and other anomalies. Blood is taken from the mother at 16–19 weeks of pregnancy and analyzed for four hormone levels—human chorionic gonadotropin (HCG), unconjugated estriol, alpha-fetoprotein (AFP), and inhibin-A. The hormone levels are compared to appropriate

standards, and the results are used to estimate the probability that the fetus has particular anomalies. QMS is a screening test rather than a diagnostic test; in the case of abnormal QMS results, parents may choose further testing such as ultrasonography or amniocentesis.

First-trimester screening for Down syndrome combines ultrasound evaluation of nuchal translucency (the thickness of the back of the fetus's neck) with maternal blood testing. This test can be done between the 10th and 14th weeks of pregnancy. This can be combined with serum testing at 16 weeks for a sequential screen that has the highest sensitivity of all of the available tests. If results indicate an increased risk of abnormality, further diagnostic studies such as amniocentesis can be done for confirmation.

Against great odds, a fetus born at the end of the second trimester might survive.



Ultrasonography provides information about the position, size, and physical condition of a fetus in the uterus.

ultrasonography The use of high-frequency sound waves to view the fetus in the uterus; also known as *ultrasound*.

sonogram The visual image of the fetus produced by ultrasonography.

amniocentesis A process in which amniotic fluid is removed and analyzed to detect possible birth defects.

chorionic villus sampling (CVS) Surgical removal of a tiny section of chorionic villi to be analyzed for genetic defects.

quadruple marker screen (QMS) A measurement of four hormones, used to assess the risk of fetal abnormalities.

TERMS



EMBRACING WELLNESS

Stress and Pregnancy

High levels of stress can have the same adverse effects on a pregnant woman as on anyone else (see Chapter 2). However, recent research suggests that stress can also affect the course of pregnancy and the health of the fetus.

Researchers have linked high levels of stress to miscarriage, preterm labor, and low birth weight. In one study, women who reported high levels of job stress were found to have a risk of miscarriage two to three times higher than that of less stressed women. Other studies have found that pregnant women who experience major life changes, traumatic experiences, or high levels of pregnancy-related anxiety are at greater risk for preterm labor and for having a low-birth-weight infant.

Stress hormones may constrict blood flow to the placenta, depriving the fetus of the oxygen and nutrients needed for growth and development. Stress hormones also play a role in triggering labor, so high stress levels may also increase the risk of preterm labor.

Stress may also affect the behavior of a pregnant woman; negative coping techniques such as use of tobacco, alcohol, and other drugs can harm a developing fetus. In contrast, social support during pregnancy has been linked to improved fetal growth and healthy birth weight.

The time in pregnancy in which stress is experienced may be important in determining its effects. A study of earthquake survivors found that women who were in their first trimester when the earthquake occurred were at increased risk for preterm labor; women farther along in their pregnancies experienced no such increase in risk. Researchers hypothesize that hormones produced in the later stages of pregnancy may protect both mother and fetus from the effects of stress.

High levels of stress have also been linked to birth defects. Although the overall risk of birth defects is very low, women who experience severe emotional trauma around the time of conception or during the first trimester are more likely to have an infant with defects of the skull, spine, palate, or limbs. The relationship between stress and birth defects is significantly greater in women with lower levels of education, suggesting that chronic stressors



and behaviors that go along with low educational attainment and low income may increase the impact of stressful life events on fetal development.

Highly stressful and traumatic societal events can also affect the sex ratio of newborn babies. The odds of a male birth have been found to decline following natural disasters, pollution events, and economic collapses, and part of this decline seems to involve a higher incidence of miscarriage of male fetuses. A 2010 study found that there were more male fetal deaths than female fetal deaths across the United States following the terrorist attacks of September 11, 2001, even in women with no personal connection to those who died. The researchers speculate that male fetuses may be more sensitive than female fetuses to stress hormones in the mother.

Even though such stressors are extreme, these studies reinforce the importance of adequate prenatal care, including stress management and social support.

test that analyzes maternal blood for fetal DNA as early as 10 weeks. It can detect increased levels of chromosome 21, which indicate a fetus with Down syndrome. MaterniT21 has a false positive rate of 0.2% in early studies. This test has been in clinical use only since October 2011.

Fetal Programming Amniocentesis, CVS, and QMS look for chromosomal, genetic, and other anomalies that typically cause immediate problems. A new area of study known as *fetal programming theory* focuses on how conditions in the womb may influence the risk of adult diseases. For example,

connect
ACTIVITY
DO IT ONLINE

Genetic counselors explain the results of the different tests so that parents can understand their implications. If a fetus is found to have a defect, it may be carried to term, aborted, or, in rare instances, treated while still in the uterus. Results of most current screening tests are not available until after week 12 of pregnancy; consequently, if abortion is chosen, it is likely to involve one of the more medically complex and physically difficult methods (see Chapter 7).

Researchers are developing new fetal screening techniques that are less invasive and that can be done earlier in pregnancy. On such test, MaterniT21, is a laboratory-developed

researchers have linked low birth weight to an increased risk of heart disease, high blood pressure, obesity, diabetes, and schizophrenia. High birth weight in female infants, however, has been linked to an increased risk of breast cancer in later life.

How might conditions during gestation affect the risk of adult diseases? A number of studies have looked at groups of people born in areas of poverty or at times of famine, when pregnant women were unable to eat properly. The poor prenatal conditions that stunt the growth of a developing fetus and lead to low birth weight may also affect specific organs. For example, if energy is limited, resources may be directed toward the developing fetal brain and away from other organs, including the liver and kidneys. Later in life, a small liver may be unable to clear cholesterol from the bloodstream, thereby increasing cholesterol levels and raising the risk of heart disease; undersized kidneys may be less able to regulate blood pressure. The fetus may also respond to limited resources by developing a permanently thrifty metabolism that triggers increased appetite and fat storage—leading to a greater risk of adult obesity and diabetes. Stress, both physical and emotional, increases maternal levels of the hormone cortisol, which in turn may permanently affect an infant's system of blood pressure regulation (see the box "Stress and Pregnancy").

Hormones may also be involved in the link between high birth weight and increased risk of breast cancer. Growth factors that contribute to high birth weight include leptin, insulin, and estrogen. Exposure to high levels of these in the womb may alter developing breast tissue in such a way that, when exposed to estrogen later in life, breast cells may be more likely to become malignant.

Although fetal programming theory is not yet embraced by all scientists, these studies emphasize that everything that occurs during pregnancy can have an impact on the developing fetus. In the future, people may be able to use information about their birth weight and other indicators of gestational conditions just as they can now use family history and genetic information—to alert them to special health risks and to help them improve their health.

The Importance of Prenatal Care

Adequate prenatal care—as described in the following sections—is essential to the health of both mother and baby. All physicians recommend that women start getting regular prenatal checkups as soon as they become pregnant. Typically this means one checkup per month during the first eight months, then one checkup per week during the final month. About 84% of pregnant women begin receiving adequate prenatal care during the first trimester; about 3.5% wait until the last trimester or receive no prenatal care at all.

Regular Checkups In the woman's first visit to her obstetrician, she will be asked for a detailed medical history of herself and her family. The physician or midwife will note any hereditary conditions that may assume increased significance during pregnancy. The tendency to develop gestational diabetes (diabetes during pregnancy only), for example, can

be inherited; appropriate treatment during pregnancy reduces the risk of serious harm.

The woman is given a complete physical exam and is informed about appropriate diet. She returns for regular checkups throughout the pregnancy, during which her blood pressure and weight gain are measured, her urine is analyzed, and the fetus's size and position are monitored. Regular prenatal visits give the mother a chance to discuss her concerns and be assured that everything is proceeding normally. Physicians, midwives, health educators, and teachers of childbirth classes can provide the mother with valuable information.

Blood Tests A blood sample is taken during the initial prenatal visit to determine blood type and detect possible anemia or Rh incompatibilities. The **Rh factor** is a blood protein. If an Rh-positive father and an Rh-negative mother conceive an Rh-positive baby, the baby's blood will be incompatible with the mother's blood. If some of the baby's blood enters the mother's bloodstream during delivery, she will develop antibodies to it just as she would toward a virus. If she has subsequent Rh-positive babies, the antibodies in the mother's blood, passing through the placenta, will destroy the fetus's red blood cells, possibly leading to jaundice, anemia, mental retardation, or death. This condition is completely treatable with a serum called *Rh-immune globulin*, which destroys Rh-positive cells as they enter the mother's body and prevents her from forming antibodies to them. Rh-immune globulin is given to Rh-negative mothers in the third trimester and again after the birth if the baby is found to be Rh-positive.

Blood may also be tested for evidence of hepatitis B, syphilis, rubella immunity, thyroid problems, and, with the mother's permission, HIV infection.

Prenatal Nutrition A nutritious diet throughout pregnancy is essential for both the mother and her unborn baby. Not only does the baby get all its nutrients from the mother, but it also competes with her for nutrients not sufficiently available to meet both their needs. When a woman's diet is low in iron or calcium, the fetus receives most of it, and the mother may become deficient in the mineral. To meet the increased nutritional demands of her body, a pregnant woman shouldn't just eat more; she should make sure that her diet is nutritionally adequate.

To maintain her own health and help the fetus grow, a pregnant woman typically needs to consume about 250–500 extra calories per day. Breastfeeding an infant requires even more energy—about 500 or more calories per day. To ensure that she's getting enough calories and nutrients, a pregnant woman should talk to her physician or a registered dietitian about her dietary habits and determine what changes she should make.

Rh factor A protein found in blood; Rh incompatibility between a mother and fetus can jeopardize the fetus's health.

TERMS



A woman's dietary needs change during pregnancy, so it's important to eat a nutritionally sound diet.

Some physicians prescribe high-potency vitamin and mineral supplements to pregnant and lactating women. Supplements can help boost the levels of nutrients available to mother and child, helping with fetal development while ensuring that the mother doesn't become nutrient-deficient. Pregnant and lactating women, however, should not take supplements without the advice of their physicians because some vitamins and minerals are harmful if taken in excess. Pregnant women also should not take herbal dietary supplements without consulting a physician.

Two vitamins—vitamin D and the B vitamin folate—are particularly important to pregnant women. Pregnant women who don't get enough vitamin D are more likely to deliver low-birth-weight babies. Chronic vitamin D deficiency has been linked to other health problems, including heart disease.

If a woman doesn't get the recommended daily amount of folate, both before and during pregnancy, her child has an increased risk of neural tube defects, including spina bifida. Any woman capable of becoming pregnant should get at least 400 μg (0.4 mg) of folic acid (the synthetic form of folate) daily from fortified foods and/or supplements, in addition to folate from a varied diet. Pregnant women should get 1000 μg every day.

QUICK STATS

Up to 2 in 1000 babies born in the United States have FAS.

—CDC, 2012

Food safety is another special dietary concern for pregnant women because foodborne pathogens can be especially dangerous to them and their unborn children. Germs such as *Listeria monocytogenes* and *Toxoplasma gondii* are both particularly worrisome. Pregnant women should avoid eating undercooked and ready-to-eat meats and should be sure to thoroughly wash produce before eating it. Pregnant women should also follow the FDA's recommendations for consumption of fish and seafood. For complete information about nutrition and food safety, see Chapter 12.

Avoiding Drugs and Other Environmental Hazards

In addition to the food the mother eats, the drugs she takes and the chemicals she is exposed to affect the fetus. Everything the mother ingests may eventually reach the fetus in some proportion. Some drugs harm the fetus but not the mother because the fetus is in the process of developing and because the proper dose for the mother is a massive dose for the fetus.

During the first trimester, when the major body structures are rapidly forming, the fetus is extremely vulnerable to environmental factors such as viral infections, radiation, drugs, and other **teratogens**, any of which can cause **congenital malformations**, or birth defects. The most susceptible body parts are those growing most rapidly at the time of exposure. The rubella (German measles) virus, for example, can cause a congenital malformation of a delicate system such as the eyes or ears, leading to blindness or deafness, if exposure occurs during the first trimester, but it does no damage later in the pregnancy. Similarly, retinoic acid exposure in the first trimester can lead to spontaneous abortion and fetal malformations such as microcephaly and cardiac anomalies. Another example is the class of medications known as anti-epileptics (such as valproic acid). The most common congenital malformations identified are open neural tube, congenital cardiac defects, urinary tract defects, skeletal abnormalities, and cleft palates.

ALCOHOL Alcohol is a potent teratogen. Getting drunk just one time during pregnancy may be enough to cause brain damage in a fetus. A high level of alcohol consumption during pregnancy is associated with spontaneous miscarriages and stillbirths. Fetuses born to mothers who have consumed alcohol are at risk for **fetal alcohol syndrome (FAS)**. A baby born with FAS is likely to be characterized by a small head and body size, unusual facial features, congenital heart

TERMS

teratogen An agent or influence that causes physical defects in a developing fetus.

congenital malformation A physical defect existing at the time of birth, either inherited or caused during gestation.

fetal alcohol syndrome (FAS) A combination of birth defects caused by excessive alcohol consumption by the mother during pregnancy.

defects, defective joints, impaired vision, mental impairment, and abnormal behavior patterns. Researchers doubt that any level of alcohol consumption is safe, and they recommend total abstinence during pregnancy (see Chapter 10).

TOBACCO About 10% of all women smoke during their pregnancy. Pregnant women who smoke should be counseled to quit, and nonsmoking pregnant women should avoid places where people smoke. Smoking during pregnancy increases the risk of miscarriage, low birth weight, immune system impairment, and infant death; it may also cause genetic damage or physical deformations. If nicotine levels in a mother's bloodstream are high, fetal breathing rate and movement become more rapid; the fetus may also metabolize cancer-causing by-products of tobacco.

Infants of women who smoke during pregnancy have poorer lung function at birth, and exposure to secondhand smoke after birth increases a baby's susceptibility to pneumonia and bronchitis. If a mother who smokes breast-feeds, her infant will be exposed to tobacco chemicals through breast milk. See Chapter 11 for more about the effects of smoking.

CAFFEINE Caffeine, a powerful stimulant, puts both mother and fetus under stress by raising the level of the hormone epinephrine. Caffeine also reduces the blood supply to the uterus. One study found that consuming the amount of caffeine in five or more cups of coffee a day doubled the risk of miscarriage. Coffee, colas, strong black tea, and chocolate are high in caffeine, as are some over-the-counter medications. A pregnant woman should limit her caffeine intake to no more than the equivalent of two cups of coffee per day.

DRUGS Some prescription drugs, such as some blood pressure medications, can harm the fetus, so they should be used only under medical supervision. Many babies born to women who use antidepressants during pregnancy suffer withdrawal symptoms after birth. These include dizziness, nausea, diarrhea and emesis, fatigue, muscle aches, chills, anxiety, insomnia, irritability, and hyperactivity. In addition, some studies indicate that these infants have persistent pulmonary hypertension. The antidepressant paroxetine has been shown to cause fetal cardiac defects. Over-the-counter drugs should be used only under a physician's direction. Large doses of vitamin A, for example, can cause birth defects.

Recreational drugs, such as cocaine, are thought to increase the risk of major birth defects. Marijuana use may also interfere with fertility treatments, and methamphetamine use is associated with underweight babies.

STIs AND OTHER INFECTIONS Infections, including those that are sexually transmitted, are another serious problem for the fetus. The most common cause of life-threatening infections in newborns is Group B streptococcus (GBS), a bacterium that can cause pneumonia, meningitis, and blood

infections. About 25–30% of all pregnant women are carriers of GBS, so routine screening at 36 weeks gestation is recommended. A carrier or who a woman who develops a fever during labor will be given intravenous antibiotics at the time of labor to reduce the risk of passing GBS to her baby.

Syphilis is a preventable and curable disease, but 15% of pregnant women have syphilis. In pregnancy, untreated early syphilis will result in a stillbirth rate of 25% and be responsible for 14% of neonatal deaths. Congenital infection is associated with severe adverse outcomes: stillbirth, premature delivery, neonatal infection, fetal growth restriction, and congenital anomalies. Long-term consequences include deafness and neurologic impairment. Penicillin is the gold standard for syphilis treatment, and it must be adjusted based on the stage of the disease. Gonorrhea can infect a baby during delivery and cause blindness. Because gonorrhea is often asymptomatic, in many states the eyes of newborns are routinely treated with erythromycin ointment to destroy gonorrheal bacteria. All pregnant women should be tested for hepatitis B, a virus that can pass from the mother to the infant at birth. Babies born to mothers with chronic hepatitis B should receive both the vaccine and immune globulin at birth.

Herpes simplex virus can cause significant morbidity and mortality for neonates. It may damage the baby's eyes, skin, and brain, leading to death. Genital herpes can be transmitted to the baby during delivery if the mother's infection is in the active phase. In women with evidence of a genital outbreak, babies should be delivered by cesarean section to decrease the risk to the fetus. Women with a history of genital herpes should be prescribed suppressive therapy with acyclovir in the last month of pregnancy. A primary outbreak of herpes can be dangerous if it occurs during pregnancy because the virus may pass through the placenta to the fetus. For this reason, it is important to know if the pregnant woman or her partner has a history of herpes.

The human immunodeficiency virus (HIV), which causes AIDS, can be passed to the fetus by an HIV-infected mother during pregnancy, labor and delivery, or breastfeeding. Nationwide, more than 9000 children under age 13 have been diagnosed with AIDS, and many more are infected with HIV. The babies most at risk are those whose mothers inject drugs or are the sex partners of men who inject drugs. HIV testing is critical for any woman at risk for HIV, and some physicians recommend routine testing for all pregnant women. Antiviral drugs, given to an HIV-infected mother during pregnancy and delivery and to her newborn immediately following birth, reduce the rate of HIV transmission from mother to infant from 25% to 5% or less. Of course women should also take all the necessary precautions against HIV infection during pregnancy. (See Chapter 18 for more about HIV and other STDs.)

Environmental factors affecting fetal or infant development are summarized in Table 8.2.

QUICK STATS

2.3 million pregnant American women become infected with an STD every year.

—CDC, 2011



TAKE CHARGE

Physical Activity during Pregnancy

According to the U.S. Department of Health and Human Services' Physical Activity Guidelines Committee, more research is needed to fully assess the effects of regular physical activity on pregnant women. Most studies conclude that a well-managed routine of physical activity should result in no significant negative outcomes—such as low birth weight or early labor.

Maintaining a regular routine of physical activity throughout pregnancy can help a mother-to-be stay healthy and feel her best. Regular exercise can improve posture and decrease common pregnancy-related discomforts, such as backaches and fatigue. There is also evidence that physical activity may prevent gestational diabetes, relieve stress, and build stamina that can be helpful during labor and delivery.

A woman who was physically active before pregnancy should be able to continue her favorite activities in moderation, except for those that carry a risk of trauma, or unless there is a medical reason to reduce or stop exercise.

The American College of Obstetricians and Gynecologists (ACOG) offers advice regarding exercise during pregnancy. For example, pregnant women should avoid exercising in the supine position (lying on the back), especially after the first trimester. Women should avoid motionless standing and strenuous lifting throughout pregnancy. In general, experts encourage low-impact aerobic activities over high-impact exercise. Pregnant women should not let their heart rate exceed 140 beats per minute and should avoid getting overheated or dehydrated.

A woman who has never exercised regularly can safely start an exercise program during pregnancy after consulting with her health care provider. A routine of regular walking is considered a safe way to start exercising during pregnancy. The ACOG recommends that any pregnant woman who exercises should stop exercising if she experiences any of the following warning signs:

- Vaginal bleeding
- Dyspnea before becoming exerted
- Dizziness
- Headache
- Pain in the chest or calves
- Weakness
- Preterm labor
- Decreased fetal movement
- Leakage of amniotic fluid

For detailed information about physical activity, see Chapter 13.

SOURCES: ACOG Committee on Obstetric Practice. 2002 (reaffirmed 2009). Committee opinion: exercise during pregnancy and the postpartum period. *Obstetrics and Gynecology* 99(1): 171–173; Physical Activity Guidelines Advisory Committee. 2008. *Physical Activity Guidelines Advisory Committee Report*, 2008. Washington, DC: U.S. Department of Health and Human Services.

Table 8.2 Selected Environmental Factors Associated with Problems in a Fetus or Infant

AGENT OR CONDITION	POTENTIAL EFFECTS
Accutane (acne medication)	Small head, mental impairment, deformed or absent ears, heart defects, cleft lip and palate
Alcohol	Unusual facial characteristics, small head, heart defects, mental impairment, defective joints
Chlamydia	Eye infections, pneumonia
Cigarette smoking	Miscarriage, stillbirth, low birth weight, respiratory problems, sudden infant death
Cocaine	Miscarriage, stillbirth, low birth weight, small head, defects of genital and urinary tracts
Cytomegalovirus (CMV)	Small head, mental impairment, blindness
Diabetes (insulin-dependent)	Malformations of the brain, spine, and heart
Gonorrhea	Eye infection leading to blindness if untreated
Herpes	Brain damage, death
HIV infection	Impaired immunity, death
Lead	Reduced IQ, learning disorders
Marijuana	Impaired fetal growth, increase in alcohol-related fetal damage
Mercury	Brain damage
Propecia (hair loss medication)	Abnormalities of the male sex organs
Radiation (high dose)	Small head, growth and mental impairment, multiple birth defects
Rubella (German measles)	Malformation of eyes or ears causing deafness or blindness; small head; mental impairment
Syphilis	Fetal death and miscarriage, prematurity, physical deformities
Tetracycline	Pigmentation of teeth, underdevelopment of enamel
Vitamin A (excess)	Miscarriage; defects of the head, brain, spine, and urinary tract

Prenatal Activity and Exercise Physical activity during pregnancy contributes to mental and physical wellness (see the box “Physical Activity during Pregnancy”). Women can continue working at their jobs until late in their pregnancy, provided the work isn’t so physically demanding that it jeopardizes their health. At the same time, pregnant women need more rest and sleep to maintain their own well-being and that of the fetus.

Kegel exercises, to strengthen the pelvic floor muscles, are recommended for pregnant women. These exercises are performed by alternately contracting and releasing the muscles used to stop the flow of urine. Each contraction should be held for about five seconds. Kegel exercises should be done several times a day for a total of about 50 repetitions daily.

Prenatal exercise classes are valuable because they teach exercises that tone the body muscles involved in birth, especially those of the abdomen, back, and legs. Toned-up muscles aid delivery and help the body regain its nonpregnant shape afterward.

Preparing for Birth Childbirth classes are almost a routine part of the prenatal experience for both mothers and fathers today. These classes typically teach the details of the birth process as well as relaxation techniques to help deal with the discomfort of labor and delivery. The mother learns and practices a variety of techniques so she will be able to choose what works best for her during labor when the time comes. The father typically acts as a coach, supporting his partner emotionally and helping her with her breathing and relaxing. He remains with her throughout labor and delivery, even when a cesarean section is performed.

Complications of Pregnancy and Pregnancy Loss

About 31% of mothers-to-be suffer complications during pregnancy. Some complications may prevent full-term development of the fetus or affect the health of the infant at birth. As discussed earlier in the chapter, exposure to harmful substances, such as alcohol or drugs, can harm the fetus. Other complications are caused by physiological problems or genetic abnormalities.

Ectopic Pregnancy In an **ectopic pregnancy**, the fertilized egg implants and begins to develop outside of the uterus, usually in an oviduct (Figure 8.6). More than 100,000 ectopic pregnancies are reported each year in the United States. Ectopic pregnancies account for 9% of all maternal deaths.

Ectopic pregnancies usually occur because the fallopian tube is blocked, most often as a result of pelvic inflammatory disease; smoking also increases a woman’s risk for ectopic pregnancy. The embryo may spontaneously abort, or the embryo and placenta may continue to expand until they rupture the oviduct. Sharp pain on one side of the abdomen or in the lower back, usually in about the

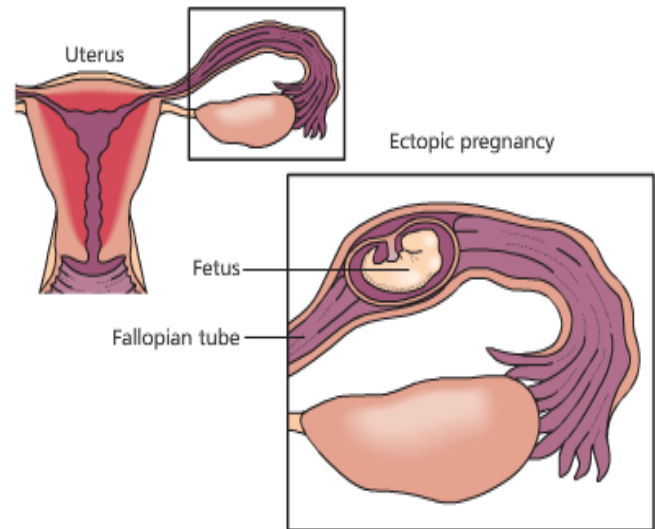


FIGURE 8.6 Ectopic pregnancy in a fallopian tube.

seventh or eighth week of pregnancy, may signal an ectopic pregnancy, and there may be irregular bleeding. If bleeding from a rupture is severe, the woman may go into shock, characterized by low blood pressure, a fast pulse, weakness, and fainting.

Surgical removal of the embryo and the oviduct may be necessary to save the mother’s life, although microsurgery can sometimes be used to repair the damaged oviduct. If diagnosed early, before the oviduct ruptures, ectopic pregnancy can often be successfully treated without surgery with the chemotherapeutic agent methotrexate. The incidence of ectopic pregnancy has more than quadrupled in the past 25 years.

Spontaneous Abortion A spontaneous abortion, or miscarriage, is the termination of pregnancy before the 20th week. Most miscarriages—about 60%—are due to chromosomal abnormalities in the fetus. Certain occupations that involve exposure to chemicals may increase the likelihood of a spontaneous abortion.

Vaginal bleeding (spotting) is usually the first sign that a pregnant woman may miscarry. She may also develop pelvic cramps, and her symptoms of pregnancy may disappear. (Note: Mild cramping is common in pregnancy and is usually not associated with miscarriage.)

One miscarriage doesn’t mean that later pregnancies will be unsuccessful, and about 70–90% of women who miscarry eventually become pregnant again. About 1% of women suffer three or more miscarriages,

A miscarriage doesn’t mean future pregnancies will fail. Up to 90% of women who miscarry get pregnant again.

ectopic pregnancy A pregnancy in which the embryo develops outside of the uterus, usually in an oviduct.

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possibly because of anatomical, hormonal, genetic, or immunological factors.

Stillbirth The terms *fetal death*, *fetal demise*, *stillbirth*, and *stillborn* all refer to the delivery of a fetus that shows no signs of life. Each year over 3 million stillbirths occur worldwide. In the United States, the stillbirth rate is a little more than 6 in 1000. Risk factors for stillbirth include smoking, advanced maternal age, obesity, multiple gestations, and chronic disease. Race is also a factor; black women have twice as many stillbirths as white women.

Preeclampsia A disease unique to human pregnancy, **preeclampsia** is characterized by elevated blood pressure and the appearance of protein in the urine. Symptoms include headache, right upper-quadrant abdominal pain, vision changes (referred to as *scotomata*), and notable increased swelling and weight gain. If preeclampsia is untreated, patients can develop seizures, a condition called **eclampsia**. Other potential complications of preeclampsia are liver and kidney damage, bleeding, fetal growth restriction, and even fetal death.

The incidence of preeclampsia is commonly cited to be about 5%, but wide variations are reported. In high-income countries, the incidence varies from 1.6 to 10 per 10,000 deliveries with a mortality rate of less than 1%. The incidence is related to race and ethnicity as well as to environmental factors and family history. It affects women at all reproductive ages.

Women with mild preeclampsia may be monitored closely as outpatients and placed on home bed rest. More severe cases may require hospitalization for close medical management and early delivery.

Placenta Previa In **placenta previa**, the placenta either completely or partially covers the cervical opening, preventing the mother from delivering the baby vaginally. As a result, the baby must be delivered by cesarean section. This condition occurs in 1 in 250 live births. Risk factors include prior cesarean delivery, multiple pregnancies, intrauterine surgery, smoking, multiple gestations, and advanced maternal age. Previas often present as painless bright red vaginal bleeding and may be associated with contractions. They cause 20% of bleeding in the third trimester.

Placental Abruption In **placental abruption**, a normally implanted placenta prematurely separates from the uterine wall. Patients experience abdominal pain, vaginal bleeding, and uterine tenderness. This causes 30% of all bleeding in the third trimester. The condition also increases the risk of fetal death. The risk factors for developing a placental abruption are maternal age, tobacco smoking, cocaine use, multiple gestation, trauma, preeclampsia, hypertension, and premature rupture of membranes.

Gestational Diabetes During gestation, about 4% of all pregnant women develop **gestational diabetes (GDM)**, in which the body loses its ability to use insulin properly. In these women, diabetes occurs only during pregnancy. The

condition stems from placental secretion of certain hormones, including growth hormone, cortisol, placental lactogen, and progesterone. GDM arises when pancreatic function is not sufficient to overcome the insulin resistance created by these pregnancy-related hormones. Women diagnosed with GDM have an increased risk of developing type 2 diabetes later in life. It is important to accurately diagnose and treat GDM because it can lead to preeclampsia, polyhydramnios (increased levels of amniotic fluid), large fetuses, birth trauma, operative deliveries, perinatal mortality, and neonatal metabolic complications.

Preterm Labor and Birth When a pregnant woman goes into labor before the 37th week of gestation, she is said to undergo *preterm labor*. Preterm labor is one of the most common reasons for hospitalizing pregnant women, but verifying true preterm labor can be difficult, and stopping it is even harder. About 30–50% of preterm labors resolve themselves, with the pregnancy continuing to full term.

Around the world, an estimated 13 million babies are born prematurely—before 37 completed weeks of gestation—each year. In the United States, about 12.8% of babies are born prematurely. The rate has increased by 9% since 2000 and by 20% since 1990. Preterm birth rates vary widely among racial and ethnic groups.

Preterm birth is the leading direct cause of newborn death, accounting for about one-third of all infant deaths. More than 1 million preterm newborns die annually in the United States. Preterm birth is also the main risk factor for newborn illness and death from other causes, particularly infection. Babies born prematurely appear to be at a higher risk of long-term health and developmental problems, including delayed development and learning problems.

Currently the causes of preterm birth are not well understood, although the trend may reflect increased medical management of labor and delivery through such means as induced labor and cesarean delivery. Risk factors for preterm birth include lack of prenatal care, smoking, drug use, stress, personal health history, infections or illness during pregnancy, obesity, exposure to environmental toxins, a previous preterm birth, and carrying multiple fetuses. However, only about half

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preeclampsia A condition of pregnancy characterized by high blood pressure and protein in the urine.

eclampsia A severe, potentially life-threatening form of preeclampsia, characterized by seizures.

placenta previa A complication of pregnancy in which the placenta covers the cervical opening, preventing the mother from delivering the baby vaginally.

placental abruption A complication of pregnancy in which a normally implanted placenta prematurely separates from the uterine wall.

gestational diabetes (GDM) A form of diabetes that occurs during pregnancy.

of the women who give birth prematurely have any known risk factors.

Labor Induction If pregnancy continues well beyond the baby's due date, it may be necessary to induce labor artificially. This is one of the most common obstetrical procedures and is typically offered to pregnant women who have not delivered and are 7–14 days past their due dates.

Low Birth Weight and Premature Birth A **low-birth-weight (LBW)** baby is one that weighs less than 5.5 pounds at birth. LBW babies may be **premature** (born before the 37th week of pregnancy) or full-term. Babies who are born small even though they're full-term are referred to as *small-for-date* or *small-for-gestational-age* babies. Low birth weight affected 8.2% of babies born in 2008 in the United States. About half of all cases are related to teenage pregnancy, cigarette smoking, poor nutrition, and poor maternal health. Other maternal factors include drug use, stress, depression, and anxiety. Adequate prenatal care is the best way to prevent LBW.

Full-term LBW babies tend to have fewer problems than premature infants. In the United States in 2008, 12.3% of babies were born prematurely. Many of the premature infant's organs are not sufficiently developed. Even mild prematurity increases an infant's risk of dying in the first month or year of life. Premature infants are subject to respiratory problems and infections. They may have difficulty eating because they may be too small to suck a breast or bottle and their swallowing mechanism may be underdeveloped. As they get older, premature infants may have problems such as learning difficulties, behavior problems, poor hearing and vision, and physical awkwardness.

Infant Mortality The U.S. rate of **infant mortality**, the death of a child at less than 1 year of age, is near its lowest point ever; however, it remains far higher than rates in most of the developed world. The United States has a fairly low infant mortality rate, with 6.7 deaths for every 1000 live births. Poverty and inadequate health care are key causes; in some inner-city areas, the infant mortality rate approaches that of developing countries, with more than 20 deaths per 1000 births. The infant mortality rate among African Americans is 2.4 times higher than that of white infants.

Other causes of infant death are congenital problems, infectious diseases, and injuries.

In **sudden infant death syndrome (SIDS)**, an apparently healthy infant dies suddenly while sleeping. About 2300 infant deaths are attributed to SIDS each year.

The number of SIDS deaths has decreased since 1992, when the "Back to Sleep" campaign was instituted to make people aware that putting babies to bed on their backs rather than on their stomachs significantly reduces the risk of SIDS. Research suggests that abnormalities in the brainstem, the part of the brain that regulates breathing, heart rate, and other basic functions, underlie the risk for SIDS. Risk is greatly increased for infants with these innate differences if they are exposed to environmental risks, such as sleeping face down; being exposed to tobacco smoke, alcohol, or other drugs; or sleeping on a soft mattress or with fluffy bedding, pillows, or stuffed toys. Overbundling a baby or keeping a baby's room too warm also increases the risk of SIDS; because of this, SIDS deaths are more common in the colder months. Exposure to nitrous dioxide air pollution is also under investigation as a possible contributing factor. Several studies have found that the use of a pacifier significantly reduces the risk of SIDS.

Coping with Loss Parents form a deep attachment to their children even before birth, and those who lose an infant before or during birth usually experience deep grief. Initial feelings of shocked disbelief and numbness may give way to sadness, anger, crying spells, and preoccupation with the loss. Physical sensations such as tightness in the chest or stomach, loss of appetite, and sleeplessness may also occur. For the mother, physical exhaustion and hormone imbalances can compound the emotional and physical stress.

Experiencing the pain of loss is part of the healing process. A support group or professional counseling is also often helpful. Planning the next pregnancy, with a physician's input, can be an important step toward recovery, as long as the mind and body are given time to heal.

CHILDBIRTH

By the end of the ninth month of pregnancy, most women are tired of being pregnant; both parents are eager to start a new phase of their lives. Most couples find the actual process of birth to be an exciting and positive experience.

Choices in Childbirth

Many couples today can choose the type of practitioner and the environment they want for the birth of their child. A

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know anyone who has lost a child to miscarriage, stillbirth, or a birth defect? If so, how did they cope with their loss? What would you do to help someone in this situation?

low birth weight (LBW) Weighing less than 5.5 pounds at birth, often the result of prematurity.

premature Born before the 37th week of pregnancy.

infant mortality The death of a child at less than 1 year of age.

sudden infant death syndrome (SIDS) The sudden death of an apparently healthy infant during sleep.

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high-risk pregnancy is probably best handled by a specialist physician in a hospital with a nursery, but for low-risk births, many options are available.

In 2006, 99.1% of babies in the United States were delivered in hospitals. Many hospitals have introduced alternative birth centers in response to criticisms of traditional hospital routines. Alternative birth centers provide a comfortable, emotionally supportive environment in close proximity to up-to-date medical equipment.

Parents can choose to have their baby delivered by a physician (an obstetrician or family practitioner) or by a certified nurse-midwife. Certified nurse-midwives are registered nurses with special training in obstetrical techniques. They are usually less expensive than physicians, and they are often part of a complete medical team that includes a backup physician in case of emergency. Nurse-midwives can usually participate in births in any setting, although this may vary according to hospital policy, state law, and the midwife's preferences. About 1 in 20 babies each year is delivered by a nurse-midwife.

Many mothers-to-be are accompanied in the delivery room by a labor companion, called a *doula*. A doula is a woman who either has been through childbirth or has extensive experience with birth. She stays with the laboring woman continuously and provides support, information, and advocacy. Supportive labor companions may improve labor progress by reducing maternal anxiety. Studies show that the presence of a knowledgeable doula can shorten the duration of labor, increase the rate of spontaneous vaginal birth, and reduce the use of narcotic painkillers, forceps delivery, and cesarean birth.

A small number of American women elect to give birth at home or in birth facilities that offer low-technology care. In 2006 nearly 25,000 home births were reported. The ACOG recommends against home births, especially for women with certain conditions such as diabetes or high blood pressure. Other groups, such as the American College of Nurse Midwives, support out-of-hospital births for healthy women with a low risk of complications.

It's important for prospective parents to discuss all aspects of labor and delivery with their physician or midwife beforehand so they can learn what to expect and can state their preferences.

Labor and Delivery

The birth process occurs in three stages (Figure 8.7). **Labor** begins when hormonal changes in both the mother and the baby cause strong, rhythmic uterine **contractions** to begin. These contractions exert pressure on the cervix and cause the

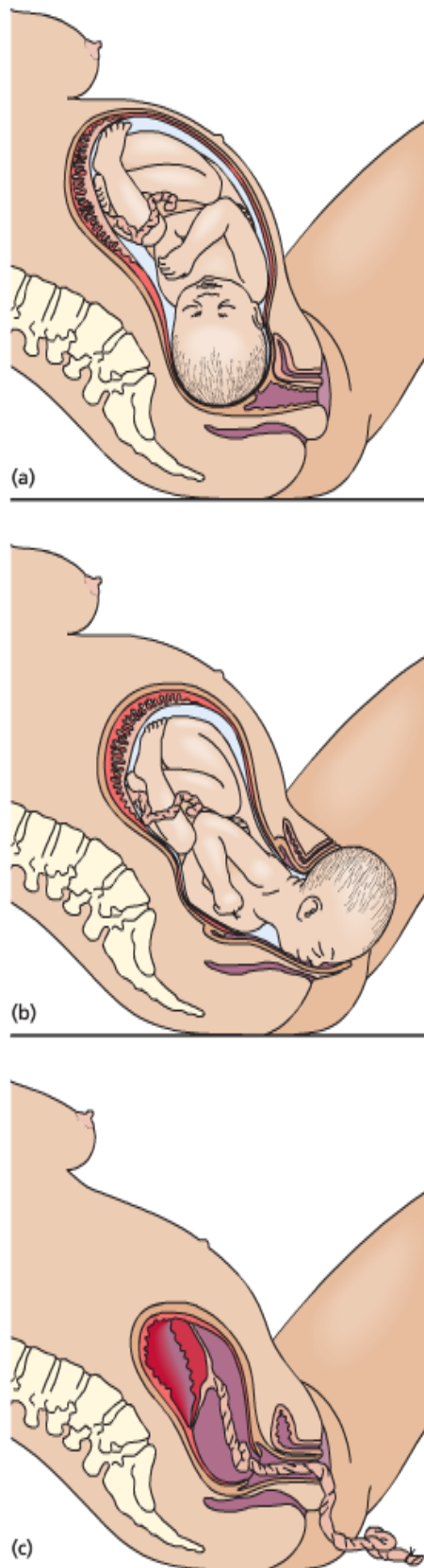


FIGURE 8.7 Birth: labor and delivery. (a) The first stage of labor; (b) the second stage of labor: delivery of the baby; (c) the third stage of labor: expulsion of the placenta.

labor The act or process of giving birth to a child, expelling it with the placenta from the mother's body by means of uterine contractions.

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contraction Shortening of the muscles in the uterine wall, which causes effacement and dilation of the cervix and assists in expelling the fetus.

lengthwise muscles of the uterus to pull on the circular muscles around the cervix, causing effacement (thinning) and dilation (opening) of the cervix. The contractions also pressure the baby to descend into the mother's pelvis, if it hasn't already. The entire process of labor and delivery usually takes between 2 and 36 hours, depending on the size of the baby, the baby's position in the uterus, the size of the mother's pelvis, the strength of the uterine contractions, the number of prior deliveries, and other factors. The length of labor is generally shorter for second and subsequent births.

The First Stage of Labor The first stage of labor averages 13 hours for a first birth, although there is a wide variation among women. It begins with cervical effacement and dilation and continues until the cervix is completely dilated. Contractions usually last about 30 seconds and occur every 15–20 minutes at first, more often later. The prepared mother relaxes as much as possible during these contractions to allow labor to proceed without being blocked by tension. Early in the first stage, a small amount of bleeding may occur as a plug of slightly bloody mucus that blocked the opening of the cervix during pregnancy is expelled. In some women, the amniotic sac ruptures and the fluid rushes out; this is sometimes referred to as the “water breaking.”

The last part of the first stage of labor, called **transition**, is characterized by strong and frequent contractions, much more intense than in the early stages of labor. Contractions may last 60–90 seconds and occur every 1–3 minutes. During transition the cervix opens completely, to a diameter of about 10 centimeters. The head of the fetus usually measures 9–10 centimeters; thus once the cervix has dilated completely, the head can pass through. Transition, which normally lasts about 30–60 minutes, is often the most difficult part of labor.

The Second Stage of Labor The second stage of labor begins with complete cervical dilation and ends with the delivery of the baby. The baby is slowly pushed down, through the bones of the pelvic ring, past the cervix, and into the vagina, which it stretches open. The mother bears down with the contractions to help push the baby down and out. Some women find this the most difficult part of labor; others find that the contractions and bearing down bring a sense of relief. The baby's back bends, the head turns to fit through the narrowest parts of the passageway, and the soft bones of the baby's skull move together and overlap as it is squeezed through the pelvis. When the top of the head appears at the vaginal opening, the baby is said to be *crowning*.

As the head of the baby emerges, the physician or midwife will remove any mucus from the mouth and nose, wipe the baby's face, and check to ensure that the umbilical cord is not around the neck. With a few more contractions, the baby's shoulders and body emerge. As the baby is squeezed through the pelvis, cervix, and vagina, the fluid in the lungs is forced out by the pressure on the baby's chest. Once this pressure is released as the baby emerges from the vagina, the chest expands and the lungs fill with air for the first time. The baby

will still be connected to the mother via the umbilical cord, which is not cut until it stops pulsating. The baby will appear wet and often is covered with a cheesy substance. The baby's head may be oddly shaped at first, due to the molding of the soft plates of bone during birth, but it usually takes on a more rounded appearance within 24 hours.

The Third Stage of Labor In the third stage of labor, the uterus continues to contract until the placenta is expelled. This stage usually takes 5–30 minutes. It is important that the entire placenta be expelled; if part remains in the uterus, it may cause infection or bleeding. Breastfeeding soon after delivery helps control uterine bleeding because it stimulates the secretion of a hormone that makes the uterus contract.

The baby's physical condition is assessed with the **Apgar score**, a formalized system for assessing the baby's need for medical assistance. Heart rate, respiration, color, reflexes, and muscle tone are individually rated with a score of 0–2, and a total score between 0 and 10 is given at 1 and 5 minutes after birth. A score of 7–10 at 5 minutes is considered normal. Most newborns are also tested for 29 specific disorders, some of which are life-threatening. The American Academy of Pediatrics endorses these tests, but they are not routinely performed in every state.

Pain Relief during Labor and Delivery Women vary in how much pain they experience in childbirth. First babies are typically the most challenging to deliver because the birth canal has never stretched to this extent before. It is recommended that women and their partners learn about labor and what kinds of choices are available for pain relief. Childbirth preparation courses are a good place to start, and communicating with one's obstetrician or midwife is essential to assessing pain relief options. Breathing and relaxation techniques such as Lamaze or Bradley have been used effectively, and they are often modified by laboring women to be even more effective. Forms of hypnosis can also be used.

The most commonly employed medical intervention for pain relief is the *epidural*. This procedure involves placing a thin plastic catheter between the vertebrae in the lower back. Medication that reduces the transmission of pain signals to the brain is given through this catheter. Local anesthetic drugs are given in low concentration to minimize weakening of the leg muscles so that the mother can effectively push during the birth. The amount of medication given is quite low and does not accumulate in the baby or interfere with the baby's transition after birth. The mother is awake and is an active participant in the birth.

Women can also elect to have narcotics, such as fentanyl or demerol, given for pain relief during labor, but these medications usually provide less pain relief than the epidural

transition The last part of the first stage of labor, during which the cervix becomes fully dilated; characterized by intense and frequent contractions.

Apgar score A formalized system for assessing a newborn's need for medical assistance.

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and, if given shortly before the birth, can cause the baby to be less vigorous at birth. Local anesthesia is available for repair of any tear or **episiotomy** (a surgical incision of the perineum to allow easier delivery of the baby) if the mother has not used an epidural for the labor.

Cesarean Deliveries In a **cesarean section**, the baby is removed through a surgical incision in the abdominal wall and uterus. Cesarean sections are necessary when a baby cannot be delivered vaginally—for example, if the baby's head is bigger than the mother's pelvic girdle or if the baby is in an unusual position. If the mother has a serious health condition such as high blood pressure, a cesarean may be safer for her than labor and a vaginal delivery. Cesareans are more common among women who are overweight or have diabetes due to cephalo-pelvic disproportion and large-for-gestational-age fetuses. Other reasons for cesarean delivery include abnormal or difficult labor, fetal distress, and the presence of a dangerous infection like herpes that can be passed to the baby during delivery.

Repeat cesarean deliveries are also very common. About 90% of American women who have had one child by cesarean have subsequent children delivered the same way. Although the risk of complications from a vaginal delivery after a previous cesarean delivery is low, there is a small (1%) risk of serious complication to the mother and baby if the previous uterine scar opens during labor (uterine rupture). For this reason, women and their physicians may choose to deliver by elective repeat cesarean.

Cesarean section is the most common hospital procedure performed in the United States, and the current cesarean delivery rate is the highest it has ever been, despite the efforts of U.S. health officials to reduce it. The rates of maternal and infant complications are higher with cesarean than with vaginal deliveries, and the mothers who have cesarean sections face more difficult postpartum recoveries. Like any major surgery, cesarean section carries some risk and should be performed only for valid medical reasons (not convenience). Women who have cesarean sections can remain conscious during the operation if they are given a regional anesthetic, and the father may be present.

The Postpartum Period

The **postpartum period**, a stage of about three months following childbirth, is a time of critical family adjustments. Parenthood begins literally overnight, and the transition can cause considerable stress.

Following a vaginal delivery, mothers usually leave the hospital within one or two days (after a cesarean section, they usually stay two to four days). Uterine contractions will occur from time to time for several days after delivery, especially during nursing, as the uterus begins to return to its prebirth size. It usually takes six to eight weeks for a woman's reproductive

organs to return to their prebirth condition. She will have a bloody discharge called *lochia* for three to six weeks after the birth.

Within the first few days after birth, a baby will undergo screening for certain genetic conditions such as sickle-cell disease; the mandated tests vary by state. The baby's head—if somewhat pointed following a vaginal delivery—will become more rounded within a few days. It takes about a week for the umbilical cord stump to shrivel and fall off. Regular infant checkups for health screenings and immunizations usually begin when the infant is only a few weeks old.

QUICK STATS

32.3% of American babies born in 2008 were delivered by cesarean section.

—CDC, 2010

Breastfeeding Lactation, the production of milk, begins about three days after childbirth. Prior to that time (sometimes as early as the second trimester), **colostrum** is secreted by the nipples. Colostrum contains antibodies that help protect the newborn from infectious diseases and is also high in protein.

The American Academy of Pediatrics recommends breastfeeding exclusively for six months, then in combination with solid food until the baby is one year of age, and then for as long after that as a mother and baby desire. Currently only 11% of U.S. mothers breast-feed exclusively for six months. Human milk is perfectly suited to the baby's nutritional needs and digestive capabilities, and it supplies the baby with antibodies. Breastfeeding decreases the incidence of infant ear infections, allergies, anemia, diarrhea, and bacterial meningitis. Preschoolers who were breastfed as babies are less likely to be overweight, and school-age children who were breastfed are less anxious and better able to cope with stress. Breastfeeding even has a beneficial effect on blood pressure and cholesterol levels later in life.

Breastfeeding is beneficial to the mother, as well. It stimulates contractions that help the uterus return to normal more rapidly, contributes to postpregnancy weight loss, and may reduce the risk of ovarian cancer, breast cancer, and postmenopausal hip fracture. Nursing also provides a sense of closeness and emotional well-being for mother and child. For women who want to breast-feed but who have problems,

TERMS

episiotomy An incision made in the perineum to widen the vaginal opening to facilitate birth and prevent uncontrolled tearing during delivery.

cesarean section A surgical incision through the abdominal wall and uterus, performed to deliver a fetus.

postpartum period The period of about three months after delivering a baby.

lactation The production of milk.

colostrum A yellowish fluid secreted by the mammary glands around the time of childbirth until milk comes in, about the third day.



Breastfeeding can enhance the bond between mother and child. The American Academy of Pediatrics recommends breastfeeding exclusively for six months and then in combination with solid food until the baby is at least one year of age.

help is available from support groups, books, or a lactation consultant.

For some women, physical problems such as tenderness or infection of the nipples can make breastfeeding difficult. If a woman has an illness or requires drug treatment, she may have to bottlefeed her baby because drugs and infectious agents may show up in breast milk. Breastfeeding can be restrictive, making it especially difficult for working mothers. Employers rarely provide nursing breaks, so bottlefeeding or the use of a breast pump (to express milk for use while the mother is away from her infant) may be the only practical alternatives. Bottlefeeding makes it easier to tell how much milk an infant is taking in, and bottlefed infants tend to sleep longer. Bottlefeeding also allows the father or other caregiver to share in the nurturing process. Both breastfeeding and bottlefeeding can be part of loving, secure parent-child relationships.

When a mother doesn't nurse, menstruation usually begins within about 10 weeks. Breastfeeding can prevent the return of menstruation for six months or longer because the hormone prolactin, which aids milk production, suppresses hormones vital to the development of mature eggs. However, ovulation—and pregnancy—can occur before menstruation returns, so breastfeeding is not a reliable contraceptive method; if a woman wishes to avoid pregnancy, she should

use a more reliable method. If the mother becomes pregnant while still nursing, she needs to make sure that she is receiving adequate nutrition because the energy requirement for both breastfeeding and gestating is immense. With proper counseling, breastfeeding can continue until near delivery.

Postpartum Depression The majority of women experience fluctuating emotions during the postpartum period as hormone levels change. The physical stress of labor, as well as dehydration, blood loss, and other physical factors, contributes to lowering the woman's stamina. About 50–80% of new mothers experience “baby blues,” characterized by episodes of sadness, weeping, anxiety, headache, sleep disturbances, and irritability. A mother may feel lonely and anxious about caring for her infant. About 5–9% of new mothers experience **postpartum depression**, a more disabling syndrome characterized by despondency, mood swings, guilt, and occasional hostility. Rest, sharing feelings and concerns with others, and relying on supportive relatives and friends for assistance are usually helpful in dealing with mild cases of the baby blues or postpartum depression, which generally last only a few weeks. If the depression is serious, professional treatment may be needed. Some men also seem to get a form of postpartum depression, characterized by anxiety about their changing roles and feelings of inadequacy. Both mothers and fathers need time to adjust to their new roles as parents.

Attachment Another feature of the postpartum period is the development of attachment—the strong emotional tie that grows between the baby and the adult who cares for the baby. Parents can foster secure attachment relationships in the early weeks and months by responding sensitively to the baby's true needs. Parents who respond appropriately to the baby's signals of gazing, looking away, smiling, and crying establish feelings of trust in their child. They feed the baby when she's hungry, for example; respond when she cries; interact with her when she gazes, smiles, or babbles; and stop stimulating her when she frowns or looks away. A secure attachment relationship helps the child develop and function well socially, emotionally, and mentally.

For most people, the arrival of a child creates a deep sense of joy and accomplishment. However, adjusting to parenthood requires effort and energy. Talking with friends and relatives about their experiences during the first few weeks or months with a baby can help prepare new parents for the period when the baby's needs may require all the energy that both parents have to expend. But the pleasures of nurturing a new baby are substantial, and many parents look back on this time as one of the most significant and joyful of their lives.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

If you are a woman, what are your views on labor and delivery options? If you have a child in the future, which facility, delivery, and pain management options do you think you would prefer? If you are a man, what are your views on participating in delivery? What role would you want to play?

postpartum depression An emotional low that may be experienced by the mother following childbirth.

TERMS

Connect to Your Choices



Have you ever thought about where you get your ideas and plans about having children? Many factors can influence our ideas, some not as obvious as others. Do you assume you will have children one day because it's an expected life path? Are you influenced by media portrayals of parents who do everything successfully—raise children, pursue careers, have active social lives? Do family members say or do things that convey their wish that you eventually have children? Are you influenced by friends who are starting families at this time?

What are the external factors that influence your choices about children? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE



Preparing for parenthood starts long before pregnancy; it includes making sound choices in all the areas of wellness.

RIGHT NOW YOU CAN:

- Take some time to think about whether you really *want* to have children. Cut through the cultural, societal, family, and personal expectations that may stand in the way of making the decision you really want to make.
- Think of one thing your mother or father did as a parent that you particularly liked; if you become a parent, consider how you can be sure to do the same thing for your children.
- Think of one thing your mother or father did as a parent that you particularly disliked; if you become a parent, consider how you can be sure to avoid doing the same thing.

IN THE FUTURE YOU CAN:

- Make behavioral changes that can improve your prospects as a parent. For example, you may need to adopt healthier eating habits or start exercising more consistently.
- If you want to be a parent someday, start looking at the many sources of information about pregnancy, childbirth, and parenting. This is a good idea for anyone—man or woman—who plans to have a family.

SUMMARY

- Factors to consider when deciding if and when to have a child include physical health and age, financial circumstances, and existing relationships.
- Preconception care examines factors such as preexisting medical conditions, current medications, age of the parents, lifestyle behaviors, infections, nutritional status, and family history of genetic disease.
- Fertilization is a complex process culminating when a sperm penetrates the membrane of the egg released from the woman's ovary.
- Infertility affects about 15% of the reproductive-age population of the United States. The leading causes of infertility in women are blocked oviducts and ovulation disorders. Exposure to toxins, injury to the testicles, and infection can cause infertility in men.
- Early signs and symptoms of pregnancy include a missed menstrual period; slight bleeding; nausea; breast tenderness; increased urination; fatigue and emotional upset; and a softening of the uterus just above the cervix.
- During pregnancy, the uterus enlarges until it pushes up into the rib cage; the breasts enlarge and may secrete colostrum; the muscles and ligaments soften and stretch; and the circulatory system, lungs, and kidneys become more efficient.
- The fetal anatomy is almost completely formed in the first trimester and is refined in the second; during the third trimester, the fetus grows and gains most of its weight, storing nutrients in fatty tissues.
- Prenatal tests include ultrasound, amniocentesis, chorionic villus sampling, and quadruple marker screening.
- Health care during pregnancy includes a complete history and physical at the beginning, followed by regular checkups and monitoring of blood pressure, weight gain, and size and position of the fetus.
- Important elements of prenatal care include good nutrition; avoiding drugs, alcohol, tobacco, infections, and other harmful environmental agents or conditions; regular physical activity; and childbirth classes.
- Pregnancy usually proceeds without major complications. Problems that can occur include ectopic pregnancy, spontaneous abortion, preeclampsia, and low birth weight. The loss of a fetus or infant is deeply felt by most parents, who need time to grieve and heal.
- Couples preparing for childbirth may have many options to choose from, including type of practitioner and facility.
- The first stage of labor begins with contractions that exert pressure on the cervix, causing effacement and dilation. The second stage begins with complete cervical dilation and ends when the baby emerges. The third stage of labor is expulsion of the placenta.
- During the postpartum period, the mother's body begins to return to its prepregnancy state, and she may begin to breast-feed. Both mother and father must adjust to their new roles as parents as they develop a strong emotional tie to their baby.

FOR MORE INFORMATION

BOOKS

American College of Obstetricians and Gynecologists. 2005. *Your Pregnancy and Birth*, 4th ed. Washington, DC: ACOG. Advice on conception, pregnancy, prenatal care, and delivery options.

American Dietetic Association. 2009. *Expect the Best: Your Guide to Healthy Eating Before, During, and After Pregnancy*. New York: Wiley. Provides up-to-date dietary information and meal-planning guides for women who want to get pregnant, are pregnant, or have had a baby.

Lees, C., et al. 2007. *Pregnancy and Birth: Your Questions Answered*. London: Dorling Kindersley. Answers hundreds of common questions about conception, pregnancy, and delivery.

Lichtman, R., et al. 2005. *Dr. Guttmacher's Pregnancy, Birth & Family Planning*, updated ed. New York: New American Library. A complete guide to contraception, conception, pregnancy, and childbirth.

Wynbrandt, J. 2008. *Encyclopedia of Genetic Disorders and Birth Defects*, 3rd ed. New York: Facts on File, Inc. A detailed overview of many types of birth defects, both inherited and noninherited.

ORGANIZATIONS AND WEBSITES

American College of Obstetricians and Gynecologists (ACOG). Provides written materials relating to many aspects of preconception care, pregnancy, and childbirth.
<http://www.acog.org>

The American Society for Reproductive Medicine. Provides up-to-date information about all aspects of infertility.
<http://www.asrm.org>

Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities. Provides information about a variety of topics related to birth defects, including fetal alcohol syndrome and the importance of folic acid.
<http://www.cdc.gov/ncbddd>

Childbirth.Org. Contains medical information and personal stories about all phases of pregnancy and birth.
<http://www.childbirth.org>

Health Resources and Services Administration (HRSA): Maternal and Child Health. Provides publications, videos, and other resources relating to maternal, infant, and family health.
www.mchb.hrsa.gov

International Council on Infertility Information Dissemination. A website that includes information about current research and treatments for infertility.
<http://www.inciid.org>

The March of Dimes. Provides public education materials about many pregnancy-related topics, including preconception care, genetic screening, diet and exercise, and the effects of smoking and drinking during pregnancy.
<http://www.marchofdimes.com>

National Institute of Child Health and Human Development. Provides information about reproductive and genetic problems; sponsors the "Back to Sleep" campaign to fight SIDS.
<http://www.nichd.nih.gov>

Resolve. Provides information, support, and referrals for people facing infertility.

<http://www.resolve.org>

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A hand is holding a clear plastic pill bottle filled with red and white capsules. The bottle is tilted, and the capsules are visible inside. In the background, there are other pill bottles, some containing orange capsules and others containing red capsules. The scene is set on a white surface, possibly a shelf or counter.

Drug Abuse and Addiction

LOOKING AHEAD...

After reading this chapter, you should be able to

- Define and discuss the concepts of addictive behavior, substance abuse, and substance dependence
- Explain factors contributing to drug abuse and addiction
- List the major categories of psychoactive drugs and describe their effects, methods of use, and potential for abuse and addiction
- Discuss social issues related to drug abuse and its prevention and treatment
- Evaluate the role of drugs and other addictive behaviors in your life and identify your risk factors for abuse or addiction

TEST YOUR KNOWLEDGE

1. Addictions always involve drugs that cause physical withdrawal symptoms when the person stops taking them.
True or false?
2. Which of the following is the most widely used illegal drug among college-age Americans?
 - a. cocaine
 - b. hallucinogens
 - c. marijuana
3. Caffeine use can produce physical dependence.
True or false?
4. Which of the following drugs is most addictive?
 - a. marijuana
 - b. nicotine
 - c. LSD
5. About what percentage of street drugs contain the promised primary ingredient?
 - a. 50%
 - b. 75%
 - c. 90%

ANSWERS

1. **FALSE.** Both assertions in this statement are wrong. Addiction does not always involve a drug, but even when it does, withdrawing from that drug may not result in physical symptoms.
2. **C.** Marijuana ranks first, followed (in order) by hallucinogens and cocaine. Alcohol remains by far the most popular drug among college-age Americans.
3. **TRUE.** Regular users of caffeine develop physical tolerance, needing more caffeine to produce the same level of alertness. Many experience withdrawal symptoms when they reduce their caffeine intake.
4. **B.** Nicotine is the most highly addictive drug.
5. **A.** This figure is even lower for drugs that are difficult to obtain or manufacture. Street drugs may be sold in unsafe dosages and are often mixed with cheaper, more hazardous substances.

The use of drugs for both medical and social purposes is widespread in America (Table 9.1). Many Americans believe that every problem has or should have a chemical solution. For fatigue, many turn to caffeine; for insomnia, sleeping pills; for anxiety or boredom, prescription medication or alcohol or other recreational drugs. Advertisements, social pressures, and the human desire for quick solutions to difficult problems all contribute to the prevailing attitude that drugs can ease all pain. But benefits often come with the risk of harmful consequences, and drug use can—and in many cases does—pose serious or even life-threatening risks.

The most serious risks are abuse and addiction. The drugs most often associated with abuse are **psychoactive drugs**—

those that alter a person's experiences or consciousness. In the short term, psychoactive drugs can cause **intoxication**, a state in which sometimes unpredictable physical and emotional changes occur. A person who is intoxicated may experience potentially serious changes in physical functioning. His or her emotions and judgment may be affected in ways that lead to uncharacteristic and unsafe behavior. Recurrent drug use can have profound physical, emotional, and social effects.

This chapter introduces the concepts of abuse and addiction, then focuses on the major classes of abused drugs, their effects, their potential for abuse and addiction, and other issues related to their use. Alcohol and nicotine—two of the most widely used and most harmful psychoactive drugs—are discussed in Chapters 10 and 11.

Table 9.1 Nonmedical Drug Use among Americans, 2010

	PERCENTAGE USING SUBSTANCE IN THE PAST 30 DAYS			
	ADULTS AGED 26 OR OLDER	YOUNG ADULTS AGED 18–25	YOUTHS AGED 12–17	ALL AMERICANS AGED 12 AND OLDER
ILLCIT DRUGS	6.6	21.5	10.1	8.9
Marijuana and hashish	4.8	18.5	7.4	6.9
Cocaine	0.5	1.5	0.2	0.6
Crack	0.2	0.2		0.1
Heroin	0.1	0.2		0.2
Methamphetamine	0.1	0.2		0.1
Hallucinogens	0.2	2.0	0.9	0.5
LSD	0.3	0.3		0.1
PCP	0.0	0.0		0.0
Ecstasy	1.3	0.6	0.5	0.3
Inhalants	0.1	0.2	1.1	0.7
Nonmedical use of psychotherapeutics	2.2	5.9	3.0	2.7
Pain relievers	4.8	4.4		2.0
Oxycontin	0.4	0.4		0.2
Tranquilizers	1.7	1.7		0.9
Stimulants	1.0	1.1		0.4
Sedatives	0.1	0.3		0.1
TOBACCO (ALL FORMS)	27.2	40.8	10.7	27.4
Cigarettes	33.5	34.2	8.3	23.0
Smokeless tobacco	5.8	6.4	2.3	3.5
Cigars	13.4	11.2		5.2
Pipe tobacco	1.9	1.8		0.8
ALCOHOL	48.7	69.5	13.6	51.8%
Binge alcohol use	33.7	40.6	7.8	23.3
Heavy alcohol use		13.6	1.7	

SOURCE: Substance Abuse and Mental Health Services Administration, *Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings*, NSDUH Series H-41, HHS Publication No. (SMA) 11-4658. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2011.

ADDICTIVE BEHAVIOR

Although addiction is most often associated with drug use, many experts now extend the concept of addiction to other behaviors. **Addictive behaviors** are habits that have gotten out of control, with resulting negative effects on a person's health. The American Society of Addiction Medicine says that **addiction** is a chronic disease that disrupts brain systems that regulate motivation and reward. The most characteristic feature of addiction is behavioral—a nearly uncontrollable pursuit of physical or psychological reward and/or relief through substance use or behaviors such as gambling. Addiction involves craving and the inability to recognize neither significant risk nor other problems with behaviors, interpersonal relationships, and emotional response. Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment, addiction is progressive and can result in disabling or deadly health consequences.

Looking at the nature of addiction and a range of addictive behaviors can help us understand similar behaviors when they involve drugs.

What Is Addiction?

Today scientists view addiction as a chronic disease that involves disruption of the brain's systems related to reward, motivation, and memory. Dysfunction in these systems leads to biological, psychological, and social effects associated

drug Any chemical other than food intended to affect the structure or function of the body.

psychoactive drug A drug that can alter a person's consciousness or experience.

intoxication The state of being mentally affected by a chemical (literally, a state of being poisoned).

addictive behavior Compulsive behavior associated with craving and pursuit of physical or psychological reward that interferes with family, school, work, and recreational activities.

addiction A chronic disease that disrupts the brain's system of motivation and reward, characterized by a compulsive desire and increasing need for a substance or behavior, and by harm to the individual and/or society.

TERMS

with pathologically pursuing pleasure or relief by substance use and other behaviors. Historically the term *addiction* was applied only when the habitual use of a drug produced chemical changes in the user's body. Though experts now agree that addiction is more fully defined by behavioral characteristics, they also agree that changes in the brain underlie addiction. One such change is **tolerance**, in which the body adapts to a drug so that the initial dose no longer produces the original emotional or psychological effects. This process means the user has to take larger and larger doses of a drug to achieve the same high. The concept of addiction as a disease process, one based in identifiable changes to brain cells and brain chemistry rather than a moral failing, has led to many advances in the understanding and treatment of drug addiction.

Some scientists think that other behaviors may share some of the chemistry of drug addiction. They suggest that activities like gambling, eating, exercising, and sex release brain chemicals that cause a pleasurable rush in much the same way that psychoactive drugs do. The brain's own chemicals thus become the "drug" that can cause addiction. These theorists suggest that all addictions—whether to drugs or to pleasurable activities—have a common mechanism in the brain. In this view, addiction is partly the result of our own natural wiring.

The view that addiction is based in our brain chemistry does *not* imply that people are not responsible for their addictive behavior. Many experts believe that it is inaccurate and counterproductive to think of all bad habits and excessive behaviors as diseases. All addictions involve an initial voluntary step, and other factors such as lifestyle and personality traits play key roles in the development of addiction.

When taken to a compulsive level, even healthy activities can turn into addictive behaviors.

Characteristics of Addiction

Experts have identified some general characteristics typically associated with addictive behaviors:

- **Reinforcement.** Addictive behaviors reinforce themselves. Reinforcement can be positive—the activity or situation reliably results in pleasure or reward. It can also be negative—avoiding the drug or activity results in stress, anxiety, discomfort, or depression.
- **Compulsion or craving.** The addict feels a strong compulsion—a nearly irresistible "hunger"—to engage in the behavior. Craving often is associated with environmental cues and accompanied by obsessive planning for the next opportunity to perform it.
- **Loss of control.** The addict loses control over the behavior and cannot block the impulse to do it.
- **Escalation.** Addiction often involves a pattern of escalation in response to tolerance. More and more of the substance or activity is required to produce its desired effects.

- **Negative consequences.** The behavior continues despite serious negative consequences, such as problems with academic or job performance, personal relationships, and health; legal or financial troubles are also typical.

The Development of Addiction

We all engage in activities that are potentially addictive. Some of these activities can be good for you if they are done appropriately and in moderation. But if a behavior starts to be excessive, it may become an addiction.

An addiction often starts when a person does something to bring pleasure or avoid pain. The activity may be drinking a beer, using the Internet, playing the lottery, or shopping. If it works, the person is likely to repeat it. Reinforcement leads to an increasing dependence on the behavior. Tolerance—caused by physical changes to brain cells and reward pathways in the brain—develops, and the person needs more of the substance or behavior to feel the expected effect. Eventually the behavior becomes a central focus of the person's life, and other areas such as school performance or relationships deteriorate. The behavior no longer brings pleasure, but repeating it is necessary to avoid **withdrawal**, which is the physical and mental pain that results from going without it.

Something that started as a seemingly innocent way of feeling good has triggered physiological changes in the brain that create a behavioral prison.

Although many common behaviors are potentially addictive, most people who engage in them do not develop problems. The reason lies in the combination of factors that are involved in the development of addiction, including personality, lifestyle, heredity, the social and physical environment, and the nature of the substance or behavior in question. For addiction to develop, these diverse

factors must come together in a certain way. For example, nicotine (the psychoactive drug in tobacco) has a very high potential for physical addiction. Genetic factors make some individuals much more likely to develop dependence and addiction if they start smoking. Other factors—family, social, or cultural—play a role in determining if someone takes a first puff and if so, whether he or she continues smoking long enough to become addicted. Like other addictions, addiction to nicotine begins with a voluntary and seemingly inconsequential "yes or no" choice that spirals catastrophically out of control.

tolerance A physical state in which the body adapts to a drug so that the initial dose no longer produces the original physical or psychological effects.

withdrawal A set of symptoms including anxiety, pain, irritability, sweating, tremors, vomiting, and insomnia.

TERMS

Characteristics of People with Addictions

The causes and course of an addiction are extremely varied, but people with addictions (commonly referred to as *addicts*) seem to share some characteristics. Many use a substance or activity as a substitute for healthier coping strategies. People vary in their ability to manage their lives, and those who have trouble dealing with stress and painful emotions may be susceptible to addiction.

Some people may have a genetic predisposition to addiction to a particular substance based on a variation in brain chemistry. People with addictive disorders usually have a distinct preference for a particular addictive behavior. They also often have problems with impulse control and self-regulation and tend to be risk takers.

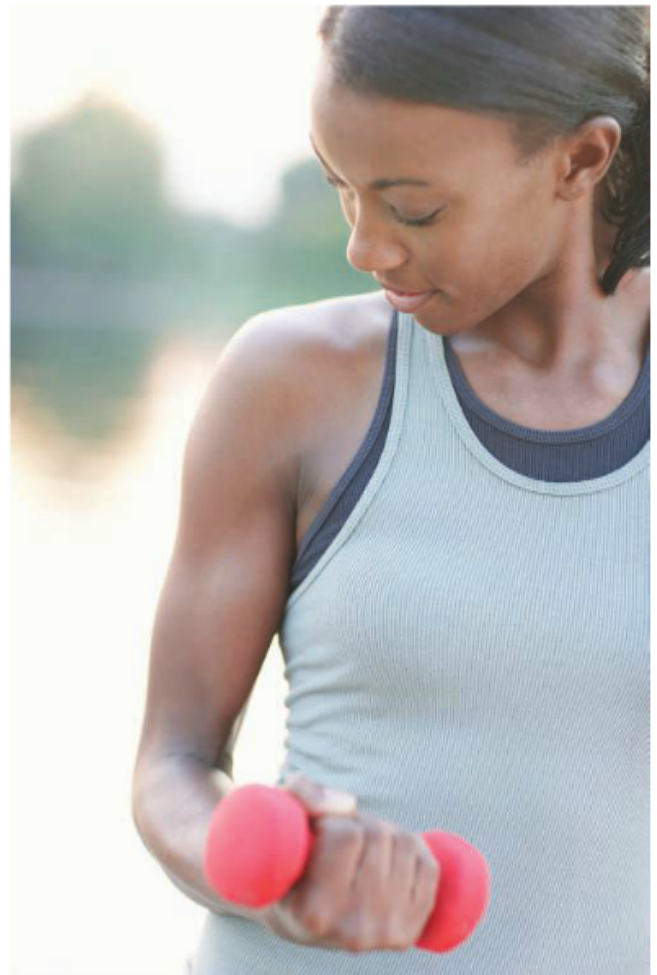
Examples of Addictive Behaviors

Behaviors that are not related to drugs can become addictive for some people. Such behaviors can include eating, gambling, and playing video games. Any substance or activity that becomes the focus of a person's life at the expense of other needs and interests can be damaging to health. Like addiction to drugs, behavioral or nondrug addiction involves symptoms such as craving, loss of control over the behavior, tolerance, withdrawal, and a repeating pattern of recovery and relapse. These symptoms suggest that nondrug addictions promote changes in the brain regions and systems associated with abuse and addiction to alcohol, nicotine, or other drugs.

Compulsive Gambling Compulsive gamblers cannot control the urge to gamble, even in the face of ruin. The consequences of compulsive gambling are not just financial; the suicide rate of compulsive gamblers is 20 times higher than that of the general population. About 1% of adult Americans are compulsive (pathological) gamblers, and another 2% are "problem gamblers." Some 42% of college students gamble at least once in a year, and about 3% gamble at least once a week. Sixty-five percent of pathological gamblers commit crimes to support their gambling habit.

The American Psychiatric Association (APA) recognizes pathological gambling as a mental disorder associated with 10 characteristic behaviors, including preoccupation with gambling, unsuccessful efforts to quit, using gambling to escape problems, and lying to family members to conceal the extent of gambling. These characteristics have much in common with the behavioral dysfunctions used to describe addiction. Many compulsive gamblers also have drug and alcohol abuse problems.

Compulsive Exercising When taken to a compulsive level, even healthy activity can turn into harmful addictions. For example, compulsive exercising is now recognized as a serious departure from normal behavior. Compulsive exercising is often



When taken to an extreme, even healthy activities such as exercise can become addictive.

QUICK STATS

48 states and the District of Columbia allow some form of legalized gambling.

—National Council on Problem Gambling, 2010

accompanied by more severe psychiatric disorders such as anorexia nervosa and bulimia (Chapter 14). Traits often associated with compulsive exercising include an excessive preoccupation and dissatisfaction with body image, use of laxatives or vomiting to lose weight, and development of other obsessive-compulsive symptoms.

Work Addiction People who are excessively preoccupied with work are often called *workaholics*. Work addiction, however, is actually based on a set of specific symptoms:

- An intense work schedule.
- The inability to limit one's own work schedule.
- The inability to relax, even when away from work.
- Failed attempts at curtailing the intensity of work (in some cases).

Work addicts are likely to neglect other aspects of life. For example, work addicts may exercise less, spend less time with family and friends, and avoid social activities.



ASSESS YOURSELF

Is Internet Use a Problem for You?

To assess the extent to which your Internet use is creating problems in your life, answer the following questions using this point scale:

Rarely	1 point
Occasionally	2 points
Frequently	3 points
Often	4 points
Always	5 points

- _____ 1. How often do you find that you stay online longer than you intended?
- _____ 2. How often do you neglect household chores to spend more time online?
- _____ 3. How often do you prefer the excitement of the Internet to intimacy with your partner?
- _____ 4. How often do you form new relationships with fellow online users?
- _____ 5. How often do others in your life complain about the amount of time you spend online?
- _____ 6. How often do your grades or schoolwork suffer because of the amount of time you spend online?
- _____ 7. How often do you check your e-mail before something else that you need to do?
- _____ 8. How often does your job performance or productivity suffer because of the Internet?
- _____ 9. How often do you become defensive or secretive when someone asks you what you do online?
- _____ 10. How often do you block out disturbing thoughts about your life with soothing thoughts about the Internet?
- _____ 11. How often do you find yourself anticipating when you will go online again?
- _____ 12. How often do you fear that life without the Internet would be boring, empty, and joyless?
- _____ 13. How often do you snap, yell, or act annoyed if someone bothers you while you are online?
- _____ 14. How often do you lose sleep due to late-night log-ins?
- _____ 15. How often do you feel preoccupied with the Internet when offline or fantasize about being online?
- _____ 16. How often do you find yourself saying "just a few more minutes" when online?
- _____ 17. How often do you try to cut down on the amount of time you spend online and fail?
- _____ 18. How often do you try to hide how long you've been online?
- _____ 19. How often do you choose to spend more time online over going out with others?
- _____ 20. How often do you feel depressed, moody, or nervous when you are offline, which goes away once you are back online?

Add the points associated with your responses to get your final score. The higher your score, the more problems your Internet usage is causing you. Here's a general scale to help you evaluate your score:

20–49 points: You are an average online user. You may surf the web a bit too long at times, but you have control over your usage.

50–79 points: You are experiencing occasional or frequent problems because of the Internet. You should consider their full impact on your life.

80–100 points: Your Internet usage is causing significant problems in your life. You should evaluate the impact of the Internet on your life and start thinking about how to address the problems.

SOURCE: Netaddiction.com. *Internet Addiction Test* (http://www.netaddiction.com/index.php?option=com_bfquiz&view=onepage&catid=46&Itemid=106). Retrieved November 3, 2010. Reprinted by permission of Dr. Kimberly S. Young.

Work addiction typically coincides with a well-known risk factor for cardiovascular disease—the Type A personality (Chapter 15). Traits associated with Type A personality include competitiveness, ambition, drive, time urgency, restlessness, hyperalertness, and hostility.

Sex and Love Addiction More controversial is the notion of addiction to sex or love. Behaviors associated with

sex addiction include an extreme preoccupation with sex, a compulsion to have sex repeatedly in a given period of time, spending a great deal of time and energy looking for partners or having sex, using sex as a means of relieving painful feelings, and suffering negative emotional, personal, and professional consequences as a result of sexual activities.

Some experts are reluctant to call compulsive sexual activity a true addiction. However, even therapists who challenge

the concept of sex addiction recognize that some people become overly preoccupied with sex, cannot seem to control their sex drive, and act in potentially harmful ways in order to stay satisfied. This pattern of sexual behavior seems to meet the criteria for addictive behaviors discussed earlier.

Compulsive Buying or Shopping A compulsive buyer repeatedly gives in to the impulse to buy more than he or she needs or can afford. Compulsive spenders usually buy luxury items rather than daily necessities, even though they are usually distressed by their behavior and its social, personal, and financial consequences. Some experts link compulsive shopping with neglect or abuse during childhood; it also seems to be associated with eating disorders, depression, and bipolar disorder.

Internet Addiction In the 15 years since the Internet became widely available, millions of Americans have become compulsive Internet users—as much as 10% of the U.S. population by some estimates. To spend more time online, Internet addicts skip other important activities. Compulsive Internet users often spend their work time online, a fact that has led many employers to adopt strict Internet usage policies. Despite negative financial, social, or academic consequences, compulsive Internet users don't feel able to stop. As with other addictive behaviors, online addicts may be using their behavior to alleviate stress or avoid painful emotions (see the box “Is Internet Use a Problem for You?”).

THE DRUG TRADITION

Drugs are chemicals other than food that are intended to affect the structure or function of the body. They include prescription medicines such as antibiotics and antidepressants; nonprescription or over-the-counter (OTC) substances such as alcohol, tobacco, and caffeine products; and illegal substances such as LSD and heroin. Using drugs to alter consciousness is an ancient and universal pursuit. People have used alcohol for celebration and intoxication for thousands of years. People in all parts of the world have exploited the psychoactive properties of plants, such as the coca plant in South America and the opium poppy in the Far East.

In the 19th century chemists began extracting the active chemicals from medicinal plants, such as morphine from the opium poppy and cocaine from the coca leaf. This was the beginning of modern **pharmacy**, the art of compounding drugs, and of **pharmacology**, the science and study of drugs. It was also the start of the era of human-made psychoactive drugs, from codeine to methamphetamine, which continues to the present.

Drug abuse and addiction among Americans were more common by 1900 than at any time before or since. In the early 1900s, concerns about drug addiction and the need to regulate drug sales and manufacture led to new federal drug laws in the United States. Middle-class use of regulated drugs dropped, and addiction became restricted to, and increasingly identified with, criminal subcultures.

Drug abuse expanded in America during the 1960s and 1970s, reaching a peak in 1979. Rates then declined until the

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever repeatedly or compulsively engaged in a behavior that had negative consequences? What was the behavior, and why did you continue? Did you ever worry that you were losing control? Were you able to bring the behavior under control?

early to mid-1990s, when drug abuse rates began to rise in certain age groups. Between 2007 and 2010, the percentage of people aged 12 or older who used marijuana increased from 5.8% to 6.9%. The percentage of people aged 12 or older who were current nonmedical users of psychotherapeutic drugs in 2010 (2.7%) was similar to that in 2009 (2.8%) and in 2002 (2.7%). The percentage of people aged 12 or older who were current users of methamphetamine in 2010 (353,000 or 0.1%) was similar to that from 2007 through 2009, but lower than that from 2002 through 2006.

Diagnosing Drug Abuse and Addiction

The American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders* is the authoritative reference for defining all sorts of behavioral disorders, including those related to drugs. The APA has chosen not to use the term *addiction*. Instead the APA's diagnostic manual refers to two forms of substance (drug) disorders: substance abuse and substance dependence. Both are maladaptive—that is, they are nonproductive or disruptive. For example, you drink a glass of wine to relax, but the wine becomes a way to avoid confronting a problem.

Abuse The APA diagnostic criteria for abuse require that drug use involve at least one of the following four characteristics:

1. Continued use despite social or interpersonal problems.
2. Repeated use resulting in failure to fulfill obligations at work, school, or home.
3. Repeated use resulting in physically hazardous situations.
4. Use resulting in legal problems.

Although the APA's definition of dependence is precise and limited, it clearly encompasses the general characteristics of addiction as that term is used throughout this chapter. The APA uses the term **physical dependence** to describe tolerance and withdrawal.

pharmacy The art of compounding drugs from various substances.

pharmacology The science and study of drugs.

physical dependence The result of physiological adaptation that occurs in response to the frequent presence of a drug; typically associated with tolerance and withdrawal.

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Dependence The APA definition of **substance dependence** incorporates what many people associate with the idea of addiction. To be considered addicted—or in the APA’s precise language, **dependent**—one must experience a cluster of three or more of these symptoms during a 12-month period:

1. Developing tolerance to the substance.
2. Experiencing withdrawal.
3. Taking the substance in larger amounts or over a longer period than was originally intended.
4. Expressing a persistent desire to cut down or regulate substance use.
5. Spending a great deal of time getting the substance, using it, or recovering from its effects.
6. Giving up or reducing important social, school, work, or recreational activities because of substance use.
7. Continuing to use the substance despite the knowledge that it is contributing to a psychological or physical problem.

Substance dependence can occur without a physical component (tolerance or withdrawal), based solely on compulsive use.

QUICK STATS

In 2010 an estimated **22.6 million Americans aged 12 or older** were current illicit drug users.

—National Survey on Drug Use and Health, 2011

- *Being a thrill-seeker.* A sense of invincibility is a factor in drug experimentation.
- *Being in a dysfunctional family.* A chaotic home life or parental abuse increases the risk of drug use. The same is true for children from a single-parent home or whose parents didn’t complete high school.
- *Being in a peer group that accepts drug use.* Young people who are uninterested in school and earn poor grades are more likely to try drugs.
- *Being poor.* Young people who live in disadvantaged areas are more likely to be around drugs at a young age.
- *Dating young.* Adolescent girls who date boys two or more years older than themselves are more likely to use drugs.

What about people who *don’t* use drugs? As a group, nonusers also share some characteristics. Not surprisingly, people who perceive drug use as risky and who disapprove of it are less likely to use drugs than those who believe otherwise. Drug use is also less common among people who have positive self-esteem and self-concept and who are assertive, independent thinkers who

are not controlled by peer pressure. Self-control, social competence, optimism, academic achievement, and regular church attendance are also linked to lower rates of drug use.

Who Abuses Drugs?

Drug abuse and addiction occur at all income and education levels, among all ethnic groups, and across all age groups (see the box “Drug Use among College Students”). Society is concerned with the casual or recreational use of illegal drugs because it is not possible to know when it will lead to addiction. Some casual users develop substance-related problems; others do not. Some drugs are more likely than others to lead to addiction (Table 9.2), but even some heroin or cocaine users do not meet the APA’s criteria for substance dependence.

It isn’t possible to accurately predict who will abuse drugs or become addicted, but young people at a high risk of *trying* drugs—the first step toward abuse—share certain characteristics:

- *Being male.* Males are twice as likely as females to abuse drugs.
- *Being a troubled adolescent.* Teens are more likely to try drugs if they have poor self-image or self-control, use tobacco, or suffer from certain mental or emotional problems.

substance dependence A cluster of cognitive, behavioral, and physiological symptoms that occur in someone who continues to use a substance despite suffering significant substance-related problems, leading to significant impairment or distress; also known as addiction.

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Table 9.2

Psychoactive Drugs and Their Potential for Producing Dependence

DRUG	POTENTIAL FOR DEPENDENCE	
	PHYSICAL	PSYCHOLOGICAL
Heroin	High	High
Morphine	High	High
Hydrocodone	High	High
Oxycodone	High	High
Codeine	Moderate	Moderate
Gamma hydroxybutric acid	Moderate	Moderate
Benzodiazepines	Moderate	Moderate
Cocaine	Possible	High
Amphetamine/methamphetamine	Possible	High
Methylphenidate	Possible	High
MDMA (Ecstasy)	None	Moderate
LSD	None	Unknown
PCP	Possible	High
Marijuana	Unknown	Moderate
Hashish	Unknown	Moderate
Alcohol	High	High

SOURCE: http://www.justice.gov/dea/pubs/drugs_of_abuse.pdf.

WELLNESS ON CAMPUS

Drug Use among College Students



Drug use in college has long been recognized as a significant health problem that affects many students. By some measures of substance abuse, double-digit prevalence is still the defining characteristic of drug use on college campuses for certain drugs.

According to the most recent survey data from the Substance Abuse and Mental Health Services Administration (SAMHSA), 21.5% of young adults aged 18–25 reported using an illicit drug in the past 30 days (see Table 9.1). This number represents a slight increase from 2008, driven largely by an increase in marijuana use. Other surveys show that recreational drug use is fairly common among college students. According to the 2011 American College Health Association National College Health Assessment, 15.9% of college students reported using marijuana at least once in the past 30 days. Another 12.9% said they had used some other drug at least once in the past 30 days.

Drug use on college campuses has been examined extensively, and many experts believe that no single factor can explain the widespread impact of this phenomenon. Family history, peer pressure, depression, anxiety, low self-esteem, and the dynamics of college life (for example, the drive to compete and a distorted perception of drug use among peers) have been suggested as potential explanations for college-age drug use.

Excessive alcohol use often accompanies illicit drug use and the risk of combining drugs and alcohol increases with the number of drinks a young adult consumes during a single session. High levels of alcohol use are associated with illicit drug use. In 2010, among the 16.9 million heavy drinkers aged 12 or older, 31.8% were current illicit drug users. Persons who were not current alcohol users were less likely to have used illicit drugs in the past month (4.0%) than those who reported (a) current use of alcohol but no

binge or heavy use (6.8%), (b) binge use but no heavy use (17.7%), or (c) heavy use of alcohol (31.8%). The term AOD (alcohol and other drug) has been coined to refer to this type of substance use among college students. Further, AOD use and depression and/or anxiety are generally recognized as coexisting conditions that require a comprehensive approach to prevention and treatment. Despite the growing awareness among college counselors and other health professionals who work with college students, it is not entirely clear whether anxiety and depression precede the onset of alcohol and drug use or whether early precollege exposure to alcohol and drug use exacerbates more serious psychiatric disorders by the time a student enters college. A third line of research suggests that AOD use, depression, and anxiety share common causes such as genetic predisposition and/or family history.

However, one aspect of drug use among college students remains clear: AOD use has dramatic consequences for the educational, family, and community lives of students. Poor academic performance has been linked with AOD use. Further, driving while intoxicated remains one of the most dangerous outcomes associated with AOD use affecting families and communities.

Several AOD prevention programs are now under way at college campuses. Several federal laws have been enacted to provide resources and a legislative framework for addressing AOD use at schools. The 1989 Drug-Free School and Communities Act and the 1998 Higher Education Amendment are examples of concerted federal legislative efforts to encourage the development of educational policies for preventing alcohol and other drug use and providing assistance to college students at risk for these harmful behaviors.



Home environments are also influential: coming from a strong family, one that has a clear policy on drug use, is another characteristic of people who don't use drugs. Young people who communicate openly with and feel supported by their parents are also less likely to use drugs.

Gender and Drug Use In 2010 the rate of current illicit drug use among people aged 12 or older was higher for males (11.2%) than for females (6.8%). Males are more likely than females to be current users of marijuana (9.1% versus 4.7%), psychotherapeutic drugs (3.0% versus 2.5%), cocaine (0.8% versus 0.4%), and hallucinogens (0.6% versus 0.3%) (see Table 9.3). Men account for about 80% of arrests for drug abuse violations, 70% of admissions for treatment, and 65% of drug-related deaths.

Why Do People Use Drugs?

Young people may be drawn to drugs by the allure of the exciting and illegal. They may be curious, rebellious, or vulnerable to peer pressure. Young people may want to imitate adult models in their lives or in the movies. Most people who take

Table 9.3 Gender and Drug Use

	NATIONAL SURVEY RESULTS: PERCENTAGE REPORTING IN PAST YEAR	
	MALES	FEMALES
Illicit drug use*	16.4	12.2
Age 12–17	10.4	9.8
Age 18–25	36.9	29.9
Age 26 and older	12.3	8.5
Drove under the influence of an illicit drug	5.5	2.6
Illicit drug or alcohol abuse or dependence	11.5	6.4
Treatment for drug or alcohol dependence	2.2	1.0

*Illicit drugs include marijuana/hashish, cocaine, heroin, hallucinogens, inhalants, and prescription-type psychotherapeutics used nonmedically.

SOURCE: Substance Abuse and Mental Health Services Administration. 2011. Results from the 2010 National Survey on Drug Use and Health: National Findings. Rockville, MD: Office of Applied Studies, NSDUH Series H-36, HHS Publication No. SMA 11-4434.



To inner-city residents deprived of traditional sources of livelihood, drug sales provide access to an income in an alternative economy.

illicit drugs do so experimentally, typically trying a drug one or more times but not continuing. The main factors in the initial choice of a drug are whether it is available and whether peers are using it.

Although some people use drugs because they have a desire to alter their mood or are seeking a spiritual experience, others are motivated by a desire to escape boredom, anxiety, depression, feelings of worthlessness, or other distressing symptoms of psychological problems. They use drugs as a way to cope with the difficulties they experience in life. For people living in poverty in the inner cities, many of these reasons for using drugs are magnified. The problems are more devastating, the need for escape more compelling. Further, the buying and selling of drugs provide access to an unofficial alternative economy that may seem like an opportunity for success.

Risk Factors for Abuse and Addiction

Why do some people use psychoactive drugs without becoming addicted, whereas others aren't as lucky? The answer seems to be a combination of physical, psychological, and social factors. Research indicates that some people may be born with a brain chemistry or metabolism that makes them more vulnerable to addiction. Other research suggests that people who were exposed to drugs in the womb may have an increased risk of abusing drugs themselves later in life.

Psychological risk factors for drug abuse include difficulty in controlling impulses and a strong need for excitement, stimulation, and immediate gratification. Feelings of rejection, hostility, aggression, anxiety, or depression are also associated with drug abuse. People may turn to drugs to blot out their emotional pain.

People with mental illnesses have a very high risk of substance dependence. Research shows that about one-third of people with psychological disorders also have a substance dependence problem; about one-third of those have another mental disorder. People with two or more coexisting

mental disorders are referred to as having *dual (co-occurring) disorders*. Diagnosing psychological problems among people with substance dependence can be difficult because drug intoxication and withdrawal can mimic the symptoms of a mental illness.

Social factors can influence drug dependence. These factors include growing up with a family member who abuses drugs, belonging to a peer group that emphasizes or encourages drug use, and living in poverty. Because they have easy access to drugs, health care professionals are also at a higher risk.

Other Risks of Drug Abuse

Addiction is not the only serious potential consequence of drug abuse. In 2009 over 2 million emergency department visits were related to drug misuse or abuse (Table 9.4).

Intoxication People who are under the influence of drugs—intoxicated—may act in uncharacteristic and unsafe ways because both their physical and mental functioning are impaired. They are more likely to be injured from a variety of causes, to have unsafe sex, and to be involved in incidents of aggression and violence.

Table 9.4

Emergency Department (ED) Visits Involving Drug Misuse or Abuse, by Drug Combination: 2009*

REASON FOR ED VISIT	NUMBER OF ED VISITS	PERCENTAGE OF ED VISITS
Pharmaceuticals only	730,138	35.3
Illicit drugs only	475,605	23.0
Illicit drugs with alcohol	211,542	10.2
Alcohol with pharmaceutical(s)	228,096	11.0
Illicit drugs with pharmaceutical(s)	206,433	10.0
Alcohol only in patients younger than 21	138,614	6.7
Illicit drugs with alcohol and pharmaceuticals	80,011	3.9
Total ED visit, drug misuse or abuse	2,070,439	100%

*From 2004 to 2009, "ED visits related to the use of pharmaceuticals with no other drug involvement rose substantially (117%), as did the use of pharmaceuticals with illicit drugs (97%), pharmaceuticals with alcohol (63%), and pharmaceuticals combined with both illicit drugs and alcohol (76%). The increases reflect over 390,000 more ED visits related to pharmaceuticals alone in 2009 compared with 2004, over 100,000 more ED visits related to pharmaceuticals and illicit drugs, and almost 90,000 more ED visits related to pharmaceuticals and alcohol... there are a number of factors that may be contributing to these increases." (Note: percentages may not equal 100 due to rounding.)

SOURCE: Substance Abuse and Mental Health Services Administration, Office of Applied Studies. 2011. *Drug Abuse Warning Network, 2008: National Estimates of Drug-Related Emergency Department Visits*. Rockville, MD: Substance Abuse and Mental Health Services Administration.

Unexpected Side Effects Psychoactive drugs have many physical and psychological effects beyond the alteration of consciousness. These effects range from nausea and constipation to paranoia, depression, and heart failure. Some drugs also carry the risk of fatal overdose.

Unknown Drug Constituents There is no quality control in the illegal drug market, so the composition, dosage, and toxicity of street drugs are highly variable. Studies indicate that half of all street drugs don't contain their promised primary ingredient. In some cases, a drug may be present in unsafe dosages or mixed with other drugs to boost its effects. Makers of street drugs aren't held to any safety standards, so illicit drugs can be contaminated or even poisonous.

Risks Associated with Injection Drug Use Heroin is the most commonly injected drug, but users can also inject cocaine, amphetamines, and other drugs. Many injection drug users (IDUs) share or reuse needles, syringes, and other injection supplies, which can easily become contaminated with the user's blood. Small amounts of blood can carry enough human immunodeficiency virus (HIV) and hepatitis C virus (HCV) to be infectious. In 2008 injection drug use accounted for more than 10% of all new HIV/AIDS cases; many more were attributed to sexual contact with IDUs. Injection drug use also accounts for nearly half of new HCV infections. The most recent surveys of active IDUs indicate that approximately one-third of young (aged 18–30 years) IDUs are HCV-infected. Older and former IDUs typically have a much higher prevalence (approximately 70%–90%) of HCV infection, reflecting the increased risk of continued injection drug use. The high HCV prevalence among former IDUs is largely attributable to needle sharing during the 1970s and 1980s—before the risks of bloodborne viruses were widely known and before educational initiatives were implemented.

Unsterile injection practices can cause skin and soft tissue infections, which can progress to gangrene (tissue death) and be fatal if untreated. Other risks include endocarditis (infection of the heart valves), tuberculosis, and tetanus.

The surest way to prevent diseases related to injection drug use is never to inject drugs. IDUs should use a new needle and syringe with each injection and should use sterile water and supplies to prepare drugs. Bleach or boiling water may kill some viruses and bacteria but are not foolproof sterilization methods. Many viruses can survive in a syringe for a month or more.

Syringe exchange programs (SEPs)—where IDUs can trade a used syringe for a new one—have been advocated to help slow the spread of HIV and reduce the rates and cost of other health problems associated with injection drug use. Opponents of SEPs argue that supplying addicts with syringes gives them the message that illegal drug use is acceptable and worsens the nation's drug problem. However, studies have shown that well-

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever tried a psychoactive drug for fun? What were your reasons for trying it? Whom were you with, and what were the circumstances? What was your experience like? What would you tell someone else who was thinking about trying a drug?

implemented SEPs do not increase the use of drugs, and most offer AIDS counseling and provide referrals to drug treatment programs. Getting people off drugs is clearly the best solution, but there are far more IDUs than treatment facilities can currently handle.

Legal Consequences Many psychoactive drugs are illegal, so possessing them can result in large fines and imprisonment. According to the Federal Bureau of Investigation (FBI), the highest arrest counts for all types of crimes were for drug abuse violations (estimated at 1,663,582 out of 13,687,241 total arrests in 2009). Table 9.5 gives the breakdown of drug abuse violations for use, possession, and sale or manufacturing, by U.S. geographic region.

QUICK

STATS

48% of confirmed new HCV infections occurred among injection drug users.

—CDC, 2009

HOW DRUGS AFFECT THE BODY

The drugs discussed in this chapter have complex and variable effects, many of which can be traced to changes in brain chemistry. However, the same drug may affect different people differently or the same person in different ways under different circumstances. Beyond a fairly predictable general change in brain chemistry, the effects of a drug may vary depending on drug factors, user factors, and social factors.

Changes in Brain Chemistry

Psychoactive drugs produce most of their key effects by acting on brain chemistry in a characteristic fashion. Before any changes in brain chemistry can occur, however, molecules of the drug have to be carried to the brain through the bloodstream via a particular route of administration. A drug that is taken by mouth has to dissolve in the stomach, be absorbed into the bloodstream through the lining of the small intestine, and then pass through the liver, heart, and lungs before returning to the heart to be carried via arteries to the brain. A drug that is already dissolved and is injected directly into the bloodstream will reach the brain in much less time, and drugs that are inhaled and absorbed by the lungs travel

Table 9.5

Arrests for Drug Abuse Violations: Percentage Distribution by Region, 2009

DRUG ABUSE VIOLATIONS		UNITED STATES TOTAL	NORTHEAST	MIDWEST	SOUTH	WEST
Total*		100.0	100.0	100.0	100.0	100.0
Sale/manufacturing†	Total	18.4	22.3	19.8	17.7	16.4
	Heroin or cocaine and their derivatives	7.1	12.7	5.2	6.8	5.4
	Marijuana	6.0	6.3	8.9	5.0	5.7
	Synthetic or manufactured drugs	1.7	1.4	1.3	3.0	0.6
	Other dangerous nonnarcotic drugs	3.5	1.8	4.4	2.8	4.8
Possession‡	Total	81.6	77.7	80.2	82.3	83.6
	Heroin or cocaine and their derivatives	17.7	18.8	10.9	17.2	21.2
	Marijuana	45.6	47.0	52.8	51.3	34.3
	Synthetic or manufactured drugs	3.7	2.8	3.9	4.8	2.6
	Other dangerous nonnarcotic drugs	14.6	9.1	12.5	9.0	25.6

*Because of rounding, the percentages may not add to 100.0.

SOURCE: Federal Bureau of Investigation, U.S. Department of Justice, Crime in the United States (<http://www2.fbi.gov/ucr/cius2009/arrests/index.html>).

to the brain even more rapidly. The more quickly a drug reaches the brain, the more likely the user is to become dependent on it.

Once a psychoactive drug reaches the brain, it acts on one or more **neurotransmitters**, either increasing or decreasing their concentration and actions. Cocaine, for example, affects dopamine, a neurotransmitter thought to play a key role in the process of reinforcement—the brain's way of telling itself "That's good; do the same thing again." When a neurotransmitter is released by one neuron, it travels across a gap, called a *synapse*, to signal another neuron. The signaling is controlled in part by removing the neurotransmitter molecules from the synapse by a process called resorption. Some drugs, such as cocaine, inhibit the resorption of dopamine, thereby extending or intensifying their action (Figure 9.1). The euphoria produced by cocaine is

Psychoactive drugs work by affecting one or more neurotransmitters in the brain.

thought to be a result of its effect on dopamine. Heroin, nicotine, alcohol, and amphetamines also affect dopamine levels.

The duration of a drug's effect depends on many factors and may range from 5 minutes (crack cocaine) to 12 or more hours (LSD). As drugs circulate through the body, they are metabolized by the liver and eventually excreted by the kidneys in urine. Small amounts may also be eliminated in other ways, including in sweat, in breast milk, and via the lungs.

Factors That Influence a Drug's Effect

When different drugs or dosages produce different effects, the differences are usually caused by one or more of five different drug factors:

1. The **pharmacological properties** of a drug are its effects on a person's body chemistry, behavior, and psychology. Pharmacological properties also include the amount of a drug required to exert various effects, the time course of the effects, and other characteristics, such as a drug's chemical composition.
2. The **dose-response function** is the relationship between the amount of drug taken and the type and

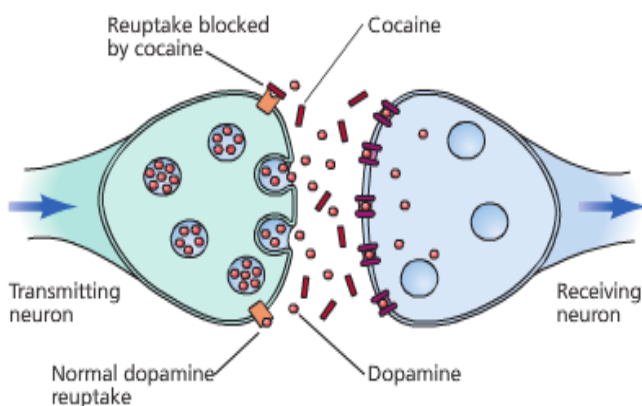


FIGURE 9.1 Effect of cocaine on brain chemistry. Under normal circumstances, the amount of dopamine at a synapse is controlled in part by the reuptake of dopamine by the transmitting neuron. Cocaine blocks the removal of dopamine from a synapse; the resulting buildup of dopamine causes continuous stimulation of the receiving neurons.

neurotransmitter A brain chemical that transmits nerve impulses.

pharmacological properties The overall effects of a drug on a person's behavior, psychology, and chemistry.

dose-response function The relationship between the amount of a drug taken and the intensity and type of the resulting effect.

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intensity of its effects. Many psychological effects of drugs reach a plateau in the dose-response function, so that increasing the dose does not increase the effect any further. With LSD, for example, the maximum changes in perception occur at a certain dose, and no further changes in perception take place if higher doses are taken. However, all drugs have more than one effect, and the dose-response functions usually are different for different effects. This means that increasing the dose of any drug may begin to result in additional effects, which are likely to be more unpleasant or dangerous at high doses.

3. The **time-action function** is the relationship between the time elapsed since a drug was taken and the intensity of its effect. A drug's effects are greatest when its concentrations in body tissues are changing fastest, especially if they are increasing.
4. The person's *drug use history* may influence the effects of a drug. A given amount of alcohol, for example, will generally affect a habitual drinker less than an occasional drinker. Tolerance to some drugs, such as LSD, builds rapidly. To experience the same effect, a user has to abstain from the drug for a period of time before that dosage will again exert its original effects.
5. The *method of use* (or *route of administration*) has a direct effect on how strong a response a drug produces. Methods of use include ingestion, inhalation, injection, and absorption through the skin or tissue linings. Drugs are usually injected in one of three ways: intravenously (IV, or mainlining), intramuscularly (IM), or subcutaneously (SC, or skin popping).

Physical Factors

Certain physical and psychological characteristics help determine how a person will respond to a drug. Body mass is one variable: the effects of a certain dose of a drug on a 150-pound person will be greater than its effect on a 200-pound person. Other variables include general health and genetic factors. For example, some people have an inherited ability to rapidly metabolize a cough suppressant called dextromethorphan, which also has psychoactive properties. These people must take a higher-than-normal dose to get a given cough suppressant effect.

If a person's biochemical state is already altered by another drug, this too can make a difference. Some drugs intensify the effects of other drugs, as is the case with alcohol and sedatives. Some drugs block the effects of other drugs, such as when a tranquilizer is used to relieve anxiety caused by cocaine. Interactions between drugs, including many prescription and OTC medications, can be unpredictable and dangerous.

One physical condition that requires special precautions is pregnancy. It can be risky for a woman to use any drugs

at all during pregnancy, including alcohol and common OTC products like cough medicine. The risks are greatest during the first trimester, when the fetus's body is rapidly forming and even small biochemical alterations in the mother can have a devastating effect on fetal development (see Chapter 8). Even later, the fetus is more susceptible than the mother to the adverse effects of any drugs she takes. The fetus may even become physically dependent on a drug being taken by the mother and suffer withdrawal symptoms after birth.

Psychological Factors

Sometimes a person's response to a drug is strongly influenced by the user's expectations about how he or she will react (the *psychological set*). With large doses, the drug's chemical properties seem to have the strongest effect on the user's response. But with small doses, psychological (and social) factors are often more important. When people strongly believe that a given drug will affect them a certain way, they are likely to experience those effects regardless of the drug's pharmacological properties. In one study, regular users of marijuana reported a moderate level of intoxication (**high**) after using a cigarette that smelled and tasted like marijuana but contained no THC, the active ingredient in marijuana. This is an example of the **placebo effect**—when a person receives an inert substance yet responds as if it were an active drug. In other studies, subjects who smoked low doses of real marijuana that they believed to be a placebo experienced no effects from the drug. Clearly the user's expectations had a greater effect on the smokers than the drug itself.

Social Factors

The *setting* is the physical and social environment surrounding the drug use. If a person uses marijuana at home with trusted friends and pleasant music, the effects are likely to be different from the effects if the same dose is taken in an austere experimental laboratory with an impassive research technician. Similarly, a dose of alcohol that produces mild euphoria and stimulation at a noisy, active cocktail party might induce sleepiness and slight depression when taken at home while alone.

time-action function The relationship between the time elapsed since a drug was taken and the intensity of its effect.

high The subjectively pleasing effects of a drug, usually felt quite soon after the drug is taken.

placebo effect A response to an inert or innocuous substance given in place of an active drug.

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Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Has an over-the-counter medication (such as a decongestant) ever made you feel strange, drowsy, or even high? Did you expect to react to the medication that way? Do such reactions influence the way you use over-the-counter drugs?

REPRESENTATIVE PSYCHOACTIVE DRUGS

The following sections and Figure 9.2 introduce six representative groups of psychoactive drugs: opioids, central nervous system (CNS) depressants, central nervous system stimulants, marijuana and other cannabis products, hallucinogens, and inhalants. Some of these drugs are classified according to how they affect the body. Others—the opioids and the cannabis products—are classified according to their chemical makeup.

Opioids

Also called *narcotics*, **opioids** are natural or synthetic (laboratory-made) drugs that relieve pain, cause drowsiness, and induce **euphoria**. Opium, morphine, heroin, methadone, codeine, hydrocodone, oxycodone, meperidine, and fentanyl are opioids. When taken at prescribed doses, opioids have beneficial medical uses, including pain relief and cough suppression. Opioids tend to reduce anxiety and produce lethargy, apathy, and an inability to concentrate. Opioid users become less active and less responsive to frustration, hunger, and sexual stimulation. These effects are more pronounced in novice users; with repeated use, many effects diminish.

Opioids are typically injected. They can also be absorbed into the body through the stomach, intestines, nasal membranes (from snorting or sniffing), or lungs (from smoking). Effects depend on the method of administration. If brain levels of the drug change rapidly, more immediate effects result. Although the euphoria associated with opioids is an important factor in their abuse, many people experience a feeling of uneasiness when they first use these drugs. Users also often feel nauseated and vomit, and they may have other unpleasant sensations. Even so, the abuse of opioids often results in dependence. Tolerance can develop rapidly and be pronounced. Withdrawal symptoms include cramps, chills, sweating, nausea, tremors, irritability, and feelings of panic.

Rates of heroin use have always been low, and in 2010 they were around 0.2% of the population aged 12 and over. The potentially high but variable purity of street heroin poses a risk of unintentional overdose. Symptoms of overdose include respiratory depression, coma, and constriction of the pupils; death can result.



Prescription painkillers such as oxycodone and hydrocodone are opioids that can have serious consequences such as fatal respiratory depression.

Nonmedical use of prescription pain relievers that contain oxycodone and hydrocodone, including Oxycontin and Vicodin, hovered at around 2% of the population aged 12 and over from 2002 to 2010. When taken as prescribed in tablet form, these drugs treat moderate to severe chronic pain and do not typically lead to abuse. However, as is the case with other opioids, use of prescription painkillers can lead to abuse and addiction. Oxycodone and hydrocodone can be abused orally; the long-acting form of oxycodone is also sometimes crushed and snorted or dissolved and injected, providing a powerful heroin-like high. When taken in large doses or combined with other drugs, oxycodone and hydrocodone can cause fatal respiratory depression.

Central Nervous System Depressants

Central nervous system **depressants**, also known as **sedative-hypnotics**, slow down the overall activity of the **central nervous system (CNS)**. The result can range from mild

opioid Any of several natural or synthetic drugs that relieve pain and cause drowsiness and/or euphoria; examples are opium, morphine, and heroin; also called a *narcotic*.

euphoria An exaggerated feeling of well-being.

depressant, or sedative-hypnotic A drug that decreases nervous or muscular activity, causing drowsiness or sleep.

central nervous system (CNS) The brain and spinal cord.

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Category	Representative drugs	Street names	Appearance	Methods of use	Short-term effects
Opioids 	Heroin	Dope, H, junk, brown sugar, smack	White/dark brown powder; dark tar or coal-like substance	Injected, smoked, snorted	Relief of anxiety and pain; euphoria; lethargy, apathy, drowsiness, confusion, inability to concentrate; nausea, constipation, respiratory depression
	Opium	Big O, black stuff, hop	Dark brown or black chunks	Swallowed, smoked	
	Morphine	M, Miss Emma, monkey, white stuff	White crystals, liquid solution	Injected, swallowed, smoked	
	Oxycodone, codeine, hydrocodone	Oxy, O.C., killer, Captain Cody, schoolboy, vike	Tablets, powder made from crushing tablets	Swallowed, injected, snorted	
Central nervous system depressants 	Barbiturates	Barbs, reds, red birds, yellows, yellow jackets	Colored capsules	Swallowed, injected	Reduced anxiety, mood changes, lowered inhibitions, impaired muscle coordination, reduced pulse rate, drowsiness, loss of consciousness, respiratory depression
	Benzodiazepines (e.g., Valium, Xanax, Rohypnol)	Candy, downers, tranks, roofies, forget-me pill	Tablets	Swallowed, injected	
	Methaqualone	Ludes, quad, quay	Tablets	Injected, swallowed	
	Gamma hydroxy butyrate (GHB)	G, Georgia home boy, grievous bodily harm	Clear liquid, white powder	Swallowed	
Central nervous system stimulants 	Amphetamine, methamphetamine	Bennies, speed, black beauties, uppers, chalk, crank, crystal, ice, meth	Tablets, capsules, white powder, white crystals	Injected, swallowed, smoked, snorted	Increased heart rate, blood pressure, metabolism; increased mental alertness and energy; nervousness, insomnia, impulsive behavior; reduced appetite
	Cocaine, crack cocaine	Blow, C, candy, coke, flake, rock, toot	White powder, beige pellets or rocks	Injected, smoked, snorted	
	Ritalin	JIF, MPH, R-ball, Skippy	Tablets	Injected, swallowed, snorted	
Marijuana and other cannabis products 	Marijuana	Dope, grass, joints, Mary Jane, reefer, skunk, weed	Dried leaves and stems	Smoked, swallowed	Euphoria, slowed thinking and reaction time, confusion, anxiety, impaired balance and coordination, increased heart rate
	Hashish	Hash, hemp, boom, gangster	Dark, resin-like compound formed into rocks or blocks	Smoked, swallowed	
Hallucinogens 	LSD	Acid, boomers, blotter, yellow sunshines	Blotter paper, liquid, gelatin tabs, pills	Swallowed, absorbed through mouth tissues	Altered states of perception and feeling; nausea; increased heart rate, blood pressure; delirium; impaired motor function; numbness, weakness
	Mescaline (peyote)	Buttons, cactus, mesc	Brown buttons, liquid	Swallowed, smoked	
	Psilocybin	Shrooms, magic mushrooms	Dried mushrooms	Swallowed	
	Ketamine	K, special K, cat valium, vitamin K	Clear liquid, white or beige powder	Injected, snorted, smoked	
	PCP	Angel dust, hog, love boat, peace pill	White to brown powder, tablets	Injected, swallowed, smoked, snorted	
	MDMA (ecstasy)	X, peace, clarity, Adam	Tablets	Swallowed	
Inhalants 	Solvents, aerosols, nitrites, anesthetics	Laughing gas, poppers, snappers, whippets	Household products, sprays, glues, paint thinner, petroleum products	Inhaled through nose or mouth	Stimulation, loss of inhibition, slurred speech, loss of motor coordination, loss of consciousness

FIGURE 9.2 Commonly abused drugs and their effects.

SOURCES: The Partnership for a Drug-Free America. 2010. *Drug Guide by Name* (http://www.drugfree.org/portal/drug_guide); U.S. Drug Enforcement Agency. 2006. *Photo Library* (http://www.usdoj.gov/dea/photo_library.html); U.S. Drug Enforcement Agency. 2010. *Drug Information* (<http://www.justice.gov/dea/concern/concern.htm>); National Institute on Drug Abuse. 2010. *Commonly Abused Drugs* (<http://www.drugabuse.gov/DrugPages/DrugsOfAbuse.html>).

sedation to death, depending on the factors involved—which drug is used, how it's taken, how tolerant the user is, and so on. CNS depressants include alcohol (Chapter 10), barbiturates, and other sedatives.

Types The various types of barbiturates are similar in chemical composition and action, but they differ in how quickly and how long they act. Drug users call barbiturates “downers” or “downs” and refer to specific brands by names that describe the color and design of the capsules. People usually take barbiturates in capsules, but may also inject them.

Antianxiety agents, also called sedatives or **tranquilizers**, include the benzodiazepines such as Xanax, Valium, Librium, clonazepam (Klonopin), and flunitrazepam (Rohypnol, also called roofies). Other CNS depressants include methaqualone (Quaalude), ethchlorvynol (Placidyl), chloral hydrate, and gamma hydroxybutyrate (GHB).

Effects CNS depressants reduce anxiety and cause mood changes, impaired muscular coordination, slurring of speech, and drowsiness or sleep. Mental functioning is also affected, but the degree varies from person to person and also depends on the kind of task the person is trying to do. Most people become drowsy with small doses, although a few become more active.

Medical Uses Barbiturates, antianxiety agents, and other sedative-hypnotics are widely used to treat insomnia and anxiety disorders and to control seizures. Some CNS depressants are used for their calming properties in combination with **anesthetics** before operations and other medical or dental procedures.

From Use to Abuse People are usually introduced to CNS depressants either through a medical prescription or through drug-using peers. The use of Rohypnol and GHB is often associated with dance clubs and raves. The abuse of CNS depressants by a medical patient may begin with repeated use for insomnia and progress to dependence through increasingly larger doses at night, coupled with doses during stressful times during the day.

Most CNS depressants, including alcohol, can lead to addiction. Tolerance, sometimes for up to 15 times the usual dose, can develop with repeated use. Tranquilizers can produce

physical dependence even at ordinary prescribed doses. Withdrawal symptoms can be more severe than those accompanying opioid addiction and are similar to the DTs of alcoholism (see Chapter 10). They may begin as anxiety, shaking, and weakness but may turn into convulsions and possibly cardiovascular collapse and death.

While intoxicated, people on depressants cannot function well. They are confused and are frequently obstinate, irritable, and abusive. Long-term use of depressants like alcohol can lead to serious physical effects including brain damage, with impaired ability to reason and make judgments.

Overdosing with CNS Depressants

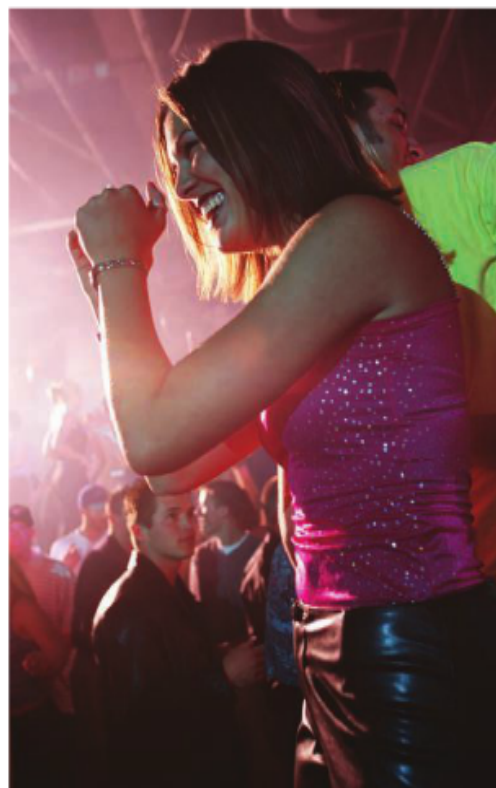
Too much depression of the central nervous system slows respiration and may stop it entirely. CNS depressants are particularly dangerous in combination with another depressant, such as alcohol. People who combine depressants with alcohol account for thousands of emergency department visits and hundreds of overdose deaths each year.

Club Drugs Some people refer to club drugs as soft drugs because they see them as recreational—for the casual, weekend user—rather than as addictive. But club drugs have many potential negative effects and are particularly potent and unpredictable when mixed with alcohol. Substitute drugs

QUICK STATS

Hospital admissions for benzodiazepine abuse tripled between 1998 and 2008.

—SAMHSA, 2011



Club drugs such as Rohypnol are referred to as “date rape drugs” because they can be added surreptitiously to drinks.

sedation The induction of a calm, relaxed, often sleepy state.

tranquilizer A CNS depressant that reduces tension and anxiety.

anesthetic A drug that produces a loss of sensation with or without a loss of consciousness.

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are often sold in place of club drugs, putting users at risk for taking dangerous combinations of unknown drugs.

Rohypnol (flunitrazepam) is a sedative that is 10 times more potent than Valium. Its effects, which are magnified by alcohol, include reduced blood pressure, dizziness, confusion, gastrointestinal disturbances, and loss of consciousness. Users of Rohypnol may develop physical and psychological dependence on the drug. Rohypnol and some other club drugs are used as “date rape drugs.” Because they can be added to beverages surreptitiously, these drugs may be unknowingly consumed by intended rape victims. In addition to depressant effects, some drugs also cause *anterograde amnesia*—the loss of memory of things occurring while under the influence of the drug. Rohypnol can be fatal if combined with alcohol.

GHB (gamma hydroxybutyrate) can be produced in clear liquid, white powder, tablet, and capsule form. GHB is a central nervous system depressant that in large doses or when taken in combination with alcohol or other depressants can cause sedation, loss of consciousness, respiratory arrest, and death. GHB may cause prolonged and potentially life-threatening withdrawal symptoms. GHB is often produced clandestinely, resulting in widely varying degrees of purity; it has been responsible for many poisonings and deaths.

Central Nervous System Stimulants

Central nervous system (CNS) **stimulants** speed up the activity of the nervous or muscular system. Under their influence, the heart rate accelerates, blood pressure rises, blood vessels constrict, the pupils and bronchial tubes dilate, and gastric and adrenal secretions increase. There is greater muscular tension and sometimes an increase in motor activity. Small doses usually make people feel more awake and alert, and less fatigued and bored. The most common CNS stimulants are cocaine, amphetamines, nicotine (Chapter 11), ephedrine, and caffeine.

Cocaine Usually derived from the leaves of coca shrubs that grow high in the Andes in South America, cocaine is a potent CNS stimulant. For centuries, natives of the Andes have chewed coca leaves both for pleasure and to increase their endurance. For a short time during the 19th century, some physicians were enthusiastic about the use of cocaine to cure alcoholism and addiction to the painkiller morphine. Enthusiasm waned after the drug's adverse side effects became apparent.

Cocaine quickly produces a feeling of euphoria, which makes it a popular recreational drug. Cocaine use surged in popularity during the early 1980s, when the drug's high price made it a status drug. The introduction of crack cocaine during the 1980s made the drug available in smaller quantities

and at lower prices to more people. The typical recreational user shifted rapidly from wealthy professionals snorting powdered cocaine to poor inner-city smokers of crack cocaine. Cocaine use peaked in 1985 with an estimated 3% of adult Americans reporting use.

METHODS OF USE Cocaine is usually snorted and absorbed through the nasal mucosa or injected intravenously, providing rapid increases of the drug's concentration in the blood and therefore fast, intense effects. Another method of use involves processing cocaine with baking soda and water, yielding the ready-to-smoke form of cocaine known as crack. Crack is typically available as small beads or pellets smokable in glass pipes. The tiny but potent beads can be handled more easily than cocaine powder and marketed in smaller, less expensive doses.

EFFECTS The effects of cocaine are usually intense but short-lived. The euphoria lasts from 5 to 20 minutes and ends abruptly, to be replaced by irritability, anxiety, or slight depression. When cocaine is absorbed via the lungs by either smoking or inhalation, it reaches the brain in about 10 seconds, and the effects are particularly intense. This is part of the appeal of smoking crack. The effects from IV injections occur almost as quickly—in about 20 seconds. Since the mucous membranes in the nose briefly slow absorption, the onset of effects from snorting takes 2–3 minutes. Heavy users may inject cocaine intravenously every 10–20 minutes to maintain the effects.

The larger the cocaine dose and the more rapidly it is absorbed into the bloodstream, the greater the immediate—and sometimes lethal—effects. Sudden death from cocaine is most commonly the result of excessive CNS stimulation that causes convulsions and respiratory collapse, irregular heartbeat, extremely high blood pressure, blood clots, and possibly heart attack or stroke. Although rare, fatalities can occur in healthy young people; among people aged 18–59, cocaine users are seven times more likely than nonusers to have a heart attack. Chronic cocaine use produces inflammation of the nasal mucosa, which can lead to persistent bleeding and ulceration of the septum between the nostrils. The use of cocaine may also cause paranoia and aggressiveness.

When steady cocaine users stop taking the drug, they experience a sudden “crash” characterized by depression, agitation, and fatigue, followed by a period of withdrawal. Their depression can be temporarily relieved by taking more cocaine, reinforcing its continued use. A binge cocaine user may go for weeks or months without using any cocaine and then take large amounts repeatedly. Although he or she may not be physically dependent, a binge cocaine user who misses work or school and risks serious health consequences is clearly abusing the drug.

Although the use of cocaine decreased in the general U.S. population after 1985, cocaine is responsible for more deaths and emergency room visits than any other illicit drug. This presumably reflects the fact that smoking crack is more toxic

stimulant A drug that increases nervous or muscular activity.

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than snorting powdered cocaine. Most deaths result from people using cocaine in combination with another substance, such as alcohol or heroin.

COCAINE USE DURING PREGNANCY Cocaine rapidly passes from the mother's bloodstream into the placenta and can have serious effects on the fetus. A woman who uses cocaine during pregnancy is at higher risk for miscarriage, premature labor, and stillbirth. She is more likely to deliver a low-birth-weight baby who has a small head circumference. Her infant may be at increased risk for defects of the genitourinary tract, cardiovascular system, central nervous system, and extremities. It is difficult to pinpoint the effects of cocaine because many women who use cocaine also use tobacco and/or alcohol.

Infants whose mothers use cocaine may also be born intoxicated. They are typically irritable and jittery and do not eat or sleep normally. These characteristics may affect their early social and emotional development because it may be more difficult for adults to interact with them. Cocaine also passes into breast milk and can intoxicate a breastfeeding infant.

Amphetamines Amphetamines (uppers) are a group of synthetic chemicals that are potent CNS stimulants. Some common drugs in this family are amphetamine (Benzedrine), dextroamphetamine (Dexedrine), and methamphetamine (Methedrine). Crystal methamphetamine (also called ice) is a smokable, high-potency form of methamphetamine, or meth. Crystal meth is easy to manufacture and cheaper than crack cocaine, and it produces a similar but longer-lasting euphoria. The use of crystal meth can quickly lead to addiction.

EFFECTS Small doses of amphetamines usually make people feel more alert. Amphetamines generally increase motor activity but do not measurably alter a normal, rested person's ability to perform tasks calling for challenging motor skills or complex thinking. When amphetamines improve performance, it is primarily by counteracting fatigue and boredom. In small doses, amphetamines increase heart rate and blood pressure and change sleep patterns.

Amphetamines are sometimes used to curb appetite, but after a few weeks the user develops tolerance and higher doses are necessary. When people stop taking the drug, their appetite usually returns, and they gain back the weight they lost unless they have made permanent changes in eating behavior.

ABUSE AND ADDICTION Much amphetamine abuse begins as an attempt to cope with a temporary situation. A student cramming for an exam or an exhausted long-haul truck driver can go a little longer by taking amphetamines, but the results can be disastrous. The likelihood of making bad judgments significantly increases. The stimulating effects may also wear off suddenly, and the user may precipitously feel exhausted or fall asleep ("crash").

Another problem is **state dependence**, the phenomenon whereby information learned in a certain drug-induced state



Crystal meth is often manufactured in small, in-home "laboratories," like the one pictured here.

is difficult to recall when the person is not in that same physiological state. Performance may deteriorate when students use drugs to study and then take tests in their normal, non-drug state. (Users of antihistamines may also experience state dependence.) Repeated use of amphetamines, even in moderate doses, often leads to tolerance and the need for increasingly larger doses. The result can be severe disturbances in behavior, including a temporary state of paranoid **psychosis**, with delusions of persecution and episodes of unprovoked violence. If injected in large doses, amphetamines produce a feeling of intense pleasure, followed by sensations of vigor and euphoria that last for several hours. As these feelings wear off, they are replaced by feelings of irritability and vague uneasiness. Long-term use of amphetamines at high doses can cause paranoia, hallucinations, delusions, and incoherence.

Methamphetamine is more addictive than other forms of amphetamine. It also is more dangerous because it is more toxic and its effects last longer. In the short term, meth can cause rapid breathing, increased body temperature, insomnia, tremors, anxiety, and convulsions. Meth use has been linked to high-risk sexual behavior and increased rates of STDs, including HIV infection. In the long term, the effects of meth can include weight loss, severe acne, hallucinations, paranoia, violence, and psychosis. Meth use causes extensive tooth decay and tooth loss, a condition referred to as "meth mouth." Meth takes a toll on the user's heart and can cause heart attack and stroke. Methamphetamine users have signs of brain damage similar to those seen in Parkinson's disease patients that appear to persist even after drug use ceases, causing impaired memory and motor coordination. Withdrawal from meth causes symptoms that may include muscle aches and

state dependence A situation in which information learned in a drug-induced state is difficult to recall when the effect of the drug wears off.

psychosis A severe mental disorder characterized by a distortion of reality; symptoms might include delusions or hallucinations.

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tremors, profound fatigue, deep depression, despair, and apathy. Addiction to methamphetamine is associated with pronounced psychological cravings and obsessive drug-seeking behavior.

Women who use amphetamines during pregnancy risk premature birth, stillbirth, low birth weight, and early infant death. Babies born to amphetamine-using mothers have a higher incidence of cleft palate, cleft lip, and deformed limbs. They may also experience symptoms of withdrawal.

Ritalin A stimulant with amphetamine-like effects, Ritalin (methylphenidate) is used to treat attention-deficit/hyperactivity disorder (ADHD). When taken orally at prescribed levels, it has little potential for abuse. When injected or snorted, however, dependence and tolerance can rapidly result.

Ephedrine Although somewhat less potent than amphetamine, ephedrine produces stimulant effects. Ephedrine has been linked to heart arrhythmia, stroke, psychotic reactions, seizures, and some deaths, and it may be particularly dangerous at high doses or when combined with another stimulant such as caffeine. The FDA has banned the sale of ephedrine (see Chapter 14).

Caffeine Caffeine is probably the most popular psychoactive drug and also one of the most ancient. It is found in coffee, tea, cocoa, soft drinks, headache remedies, and OTC preparations like NōDōz. (Table 9.6 lists typical levels of caffeine in several popular beverages.) In ordinary doses, caffeine produces greater alertness and a sense of well-being. It also decreases feelings of fatigue or boredom, so using caffeine may enable a person to keep at physically tiring or repetitive tasks longer. Such use is usually followed, however, by a sudden let-down. Caffeine does not noticeably influence a person's ability to perform complex mental tasks unless fatigue, boredom, or other factors have already affected normal performance.

Caffeine mildly stimulates the heart and respiratory system, increases muscular tremor, and enhances gastric secretion. Higher doses may cause nervousness, anxiety, irritability, headache, disturbed sleep, and gastric irritation or peptic ulcers. In people with high blood pressure, caffeine can cause blood pressure to rise even further above normal; in people with type 2 diabetes, caffeine may cause glucose and insulin levels to rise after meals.

Drinks containing caffeine are rarely harmful for most people, but some tolerance develops, and withdrawal symptoms of irritability, headaches, and even mild depression occur. Thus although we don't usually think of caffeine as a dependence-producing drug, for some people it is. People can usually avoid problems by simply decreasing their daily intake of caffeine. If intake is decreased gradually, withdrawal symptoms can be reduced or avoided. About 80–90% of American adults consume caffeine regularly. The average daily intake is about 280 mg.

In addition to being one of the most popular psychoactive drugs, caffeine is one of the most ancient.

Table 9.6

Caffeine Content of Popular Beverages

	SERVING SIZE	TYPICAL CAFFEINE LEVEL (MG)*
COFFEE		
Regular coffee, brewed	8 oz.	95
Regular coffee, instant	8 oz.	93
Espresso	1 oz.	64
Decaffeinated coffee, brewed	8 oz.	5
Decaffeinated coffee, instant	8 oz.	2
TEA		
Regular tea, brewed	8 oz.	47
Decaffeinated tea, brewed	8 oz.	2
Green tea, brewed	8 oz.	Varies
SODA		
Code Red Mountain Dew	12 oz.	54
Mello Yello	12 oz.	53
Diet Coke	12 oz.	47
Dr. Pepper, Diet Dr. Pepper	12 oz.	41
Sunkist Orange Soda	12 oz.	41
Pepsi	12 oz.	38
Coca-Cola Classic, Diet Pepsi	12 oz.	35
ENERGY DRINKS		
No Name	8.4 oz.	280
SoBe No Fear	16 oz.	174
Monster Energy, Rockstar	16 oz.	160
SoBe Adrenaline Rush	16 oz.	152
Full Throttle, Full Throttle Fury	16 oz.	144
AMP Energy Drink	16 oz.	143
Red Bull	8.3 oz.	76
Vault	8 oz.	47

*Caffeine levels vary greatly by brand of product, manner of preparation, and amount consumed. The amounts shown here are averages based on tests conducted by a variety of organizations. The U.S. Food and Drug Administration limits the amount of caffeine in cola and pepper soft drinks to 71 milligrams per 12-ounce serving. To find the exact amount of caffeine in any product, check that product's label.

SOURCES: Center for Science in the Public Interest. 2007. *Caffeine Content of Food & Drugs* (<http://www.cspinet.org/new/cafcart.htm>); Mayo Clinic. 2008. *Caffeine Content in Tea, Soda, and More* (<http://www.mayoclinic.com/health/caffeine/AN01211>); U.S. Department of Agriculture, Agricultural Research Service. 2009. *USDA National Nutrient Database for Standard Reference, Release 22* (<http://www.ars.usda.gov/ba/bhnrc/ndl>).

ENERGY "SHOTS" The popularity of small (1.5–3 oz) energy drinks has increased dramatically in recent years. Worldwide sales of products such as 5-Hour Energy reached \$9 billion in 2011. Because these products are sold as dietary supplements rather than food, their caffeine content is not regulated by the Food and Drug Administration. Each 2-oz "shot" typically contains the same amount (roughly 100 mg) of caffeine as a regular-size cup of coffee.



Marijuana is the most widely used illegal drug in the United States.

Marijuana and Other Cannabis Products

Marijuana is the most widely used illegal drug in the United States, with 17.4 million current users. Marijuana is a crude preparation of various parts of the Indian hemp plant *Cannabis sativa*, which grows in most parts of the world. THC (tetrahydrocannabinol) is the main active ingredient in marijuana. The potency of marijuana preparations depends on the THC content and varies widely. Marijuana plants that grow wild often have less than 1% THC in their leaves. When selected strains are cultivated by separation of male and female plants (*sinsemilla*), the bud leaves from the flowering tops may contain 7–8% THC. Hashish, a potent preparation made from the thick resin that exudes from the marijuana leaves, may contain up to 14% THC.

These various preparations have all been known and used for centuries, so the frequently heard claim that today's marijuana is more potent than the marijuana of the 1970s is not strictly true. However, because a greater proportion of the marijuana sold today is the higher-potency (and more expensive) *sinsemilla*, the average potency of street marijuana has increased.

Marijuana is usually smoked, but it can also be ingested. The classification of marijuana is a matter of some debate. For this reason, it is treated separately here.

Short-Term Effects and Uses As is true with most psychoactive drugs, the effects of a low dose of marijuana are strongly influenced both by the user's expectations and by past experiences. At low doses, marijuana users typically experience euphoria, a heightening of subjective sensory experiences, a slowing down of the perception of passing time, and a relaxed attitude. These pleasant effects are the reason this drug is so widely used. With moderate doses, marijuana's effects become stronger, and the user can also expect to have impaired memory function, disturbed thought patterns, lapses of attention, and feelings of **depersonalization**, in which the mind seems to be separated from the body.

At higher doses, marijuana's effects are determined mostly by the drug itself rather than by the user's expectations and setting. Very high doses produce feelings of depersonalization, marked sensory distortion, and changes in body image (such as a feeling that the body is very light). Inexperienced users sometimes think these sensations mean they are going crazy and become anxious or even panicky. Unexpected reactions are the leading reason for emergency department visits by users of marijuana or hashish.

Physiologically, marijuana increases heart rate and dilates certain blood vessels in the eyes, which creates the characteristic bloodshot eyes. The user may also feel less inclined toward physical exertion and may feel particularly hungry or thirsty. Because THC affects parts of the brain controlling balance, coordination, and reaction time, marijuana use impairs driving performance. The combination of alcohol and marijuana is even more dangerous: even a low dose of marijuana, when combined with alcohol, significantly impairs driving performance and increases crash risk.

In 1999 the Institute of Medicine determined that some compounds in marijuana may have legitimate medical use. For example, marijuana has been shown to ease pain, reduce nausea, and increase appetite. These benefits led several states to approve the use of "medical marijuana" by extremely ill patients, with physician monitoring. However, because growing, selling, or possessing marijuana is a federal crime, the Supreme Court has held that state laws permitting medical marijuana use cannot supersede federal law. This means anyone who uses marijuana for medical reasons—even in a state that approves such use—can still be prosecuted under federal drug laws, although the Obama administration made it known that it would not pursue such prosecutions. Currently more than 30 states have medical marijuana laws on their books.

Long-Term Effects The most probable long-term effect of smoking marijuana is respiratory damage, including

depersonalization A state in which a person loses the sense of his or her reality or perceives his or her body as unreal.

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impaired lung function and chronic bronchial irritation. Although there is no evidence linking marijuana use to lung cancer, it may cause changes in lung tissue that promote cancer growth. Marijuana users may be at increased risk for emphysema and cancer of the head and neck, and among people with chronic conditions like cancer and AIDS, marijuana use is associated with increased risk of fatal lung infections. (These are key reasons why the Institute of Medicine has recommended the development of alternative methods of delivering the potentially beneficial compounds in marijuana.) Heavy users may experience learning problems, as well as subtle impairments of attention and memory that may or may not be reversible following long-term abstinence. Long-term use may also decrease testosterone levels and sperm counts and increase sperm abnormalities.

Heavy marijuana use during pregnancy may cause impaired fetal growth and development, low birth weight, and increased risk of ectopic pregnancy. Marijuana may act synergistically with alcohol to increase the damaging effects of alcohol on the fetus. THC rapidly enters breast milk and may impair an infant's early motor development.

Dependence Regular users of marijuana can develop tolerance; some develop dependence, and researchers estimate that 1.5% of Americans meet the APA criteria for marijuana dependence. Withdrawal symptoms may occur in the majority of dependent or heavy users. Common symptoms include anger or aggression, irritability, nervousness or restlessness, sleep difficulties, and decreased appetite or weight loss.

Hallucinogens

Hallucinogens are a group of drugs whose predominant pharmacological effect is to alter the user's perceptions, feelings, and thoughts. Hallucinogens include the following:

- LSD (lysergic acid diethylamide)
- MDMA (methylenedioxymethamphetamine)
- Mescaline
- Psilocybin
- STP (4-methyl-2,5-dimethoxyamphetamine)
- DMT (dimethyltryptamine)
- Ketamine
- PCP (phencyclidine)

These drugs are most commonly ingested or smoked

LSD LSD is one of the most powerful psychoactive drugs. Tiny doses will produce noticeable effects in most people, such as an altered sense of time, visual disturbances, and an improved sense of hearing, mood changes, and distortions in how people perceive their bodies. Dilation of the pupils and slight dizziness, weakness, and nausea may also occur. With larger doses, users may experience a phenomenon known as **synesthesia**: feelings of depersonalization, and other alterations in the perceived relationship between the self and external reality.

Many hallucinogens induce tolerance so quickly that after only one or two doses their effects decrease substantially. The user must then stop taking the drug for several days before his or her system can be receptive to it again. These drugs cause little drug-seeking behavior and no physical dependence or withdrawal symptoms.

The immediate effects of low doses of hallucinogens are determined largely by expectations and setting. Many effects are hard to describe because they involve subjective and unusual dimensions of awareness—the **altered states of consciousness** for which these drugs are famous. For this reason, hallucinogens have acquired a certain aura not associated with other drugs. People have taken LSD in search of a religious or mystical experience or in the hope of exploring new worlds. During the 1960s some psychiatrists gave LSD to their patients to help them talk about their repressed feelings.

A severe panic reaction, which can be terrifying in the extreme, can result from taking any dose of LSD. It is impossible to predict when a panic reaction will occur. Some LSD users report having had hundreds of pleasurable and ecstatic experiences before having a bad trip, or bummer. If the user is already in a serene mood and feels no anger or hostility and if he or she is in secure surroundings with trusted companions, a bad trip may be less likely, but a tranquil experience is not guaranteed.

Even after the drug's chemical effects have worn off, spontaneous flashbacks and other psychological disturbances can occur. **Flashbacks** are perceptual distortions and bizarre thoughts that occur after the drug has been entirely eliminated from the body. Although they are relatively rare phenomena, flashbacks can be extremely distressing. They are often triggered by specific psychological cues associated with the drug-taking experience, such as certain mood states or even types of music.

MDMA MDMA (methylenedioxymethamphetamine), also known as Ecstasy, may be classified as a hallucinogen or a stimulant. Users may experience euphoria, increased energy, and a heightened sense of belonging. Using MDMA can produce dangerously high body temperature and potentially fatal dehydration. Some users experience confusion, depression, anxiety, paranoia, muscle tension, involuntary teeth clenching, blurred vision, nausea, and seizures. Even low doses can affect concentration, judgment, and driving ability. Tolerance can develop, leading users to take the drug

hallucinogen Any of several drugs that alter perception, feelings, or thoughts; examples are LSD, mescaline, and PCP.

synesthesia A condition in which a stimulus evokes not only the sensation appropriate to it but also another sensation of a different character, such as when a color evokes a specific smell.

altered states of consciousness Profound changes in mood, thinking, and perception.

flashback A perceptual distortion or bizarre thought that recurs after the chemical effects of a drug have worn off.

TERMS

more frequently, to use higher doses, or to combine MDMA with other drugs to enhance the drug's effects.

Other Hallucinogens Most other hallucinogens have the same general effects as LSD, but there are some variations. For example, a DMT or ketamine high does not last as long as an LSD high; an STP high lasts longer. MDMA has both hallucinogenic and amphetamine-like properties. Tolerance to MDMA develops quickly, and high doses can cause anxiety, delusions, and paranoia.

PCP reduces and distorts sensory input, especially proprioception—the sensation of body position and movement—and creates a state of sensory deprivation. PCP was initially used as an anesthetic but was unsatisfactory because it caused agitation, confusion, and delirium (loss of contact with reality). Because it can be easily made, PCP is often available illegally and is sometimes used as an inexpensive replacement for other psychoactive drugs.

The effects of ketamine are similar to those of PCP—confusion, agitation, aggression, and lack of coordination—but they tend to be less predictable. Tolerance to either drug can develop rapidly.

Mescaline, derived from the peyote cactus, is the ceremonial drug of the Native American Church. It causes effects similar to LSD, including altered perception and feeling; increased body temperature, heart rate, and blood pressure; weakness and trembling; and sleeplessness. Mescaline is expensive, so most street mescaline is diluted LSD or a mixture of other drugs. Hallucinogenic effects can be obtained from certain mushrooms (*Psilocybe mexicana*, or “magic mushrooms”), certain morning glory seeds, nutmeg, jimsonweed, and other botanical products, but unpleasant side effects, such as dizziness, have limited the popularity of these products.

Inhalants

Inhaling certain chemicals can produce effects ranging from heightened pleasure to delirium and death. Inhalants fall into several major groups:

- Volatile solvents, which are found in products such as paint thinner, glue, and gasoline
- Aerosols, which are sprays that contain propellants and solvents

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know any young teens who may be at risk for using inhalants? If so, would you try to intervene in some way? What would you tell a youngster to convince him or her to stop inhaling chemicals?

- Nitrites, such as butyl nitrite and amyl nitrite
- Anesthetics, which include nitrous oxide (laughing gas)

Inhalant use tends to be highest among younger adolescents and declines with age. Inhalant use is difficult to control because inhalants are easy to obtain. They are present in a variety of seemingly harmless products, from dessert-topping sprays to underarm deodorants, that are both inexpensive and legal. Using the drugs also requires no illegal or suspicious paraphernalia. Inhalant users get high by sniffing, snorting, “bagging” (inhaling fumes from a plastic bag), or “huffing” (placing an inhalant-soaked rag in the mouth).

Although different in makeup, nearly all inhalants produce effects similar to those of anesthetics, which slow down body functions. Low doses may cause users to feel slightly stimulated; at higher doses, users may feel less inhibited and less in control. Sniffing high concentrations of the chemicals in solvents or aerosol sprays can cause a loss of consciousness, heart failure, and death. High concentrations

QUICK

STATS

68% of inhalant users were under the age of 18 when they first tried it.

—SAMHSA, 2010



Inhalant use is difficult to monitor and control because inhalants are found in many inexpensive and legal products.

of any inhalant can also cause death from suffocation by displacing oxygen in the lungs and central nervous system. Deliberately inhaling from a bag or in a closed area greatly increases the chances of suffocation. Other possible effects of the excessive or long-term use of inhalants include damage to the nervous system; hearing loss; increased risk of cancer; and damage to the liver, kidneys, and bone marrow.

Synthetic Recreational Drugs

In recent years herbal or synthetic recreational drugs have become increasingly available. These “designer drugs” are intended to have pharmacological effects similar to those of illicit drugs but to be chemically distinct from them and therefore either legal or impossible to detect in drug screening. The drugs fall into two main groups. One group is marketed as synthetic marijuana and sold as “herbal incense,” or “herbal highs” with names such as Spice, K2, Genie, and Nice Guy. The other group is marketed as stimulants with properties like those of cocaine or amphetamine and is sold as “bath salts” with names such as Zoom, Ivory Wave, and White Rush.

Spice and other synthetic mimics of THC are distributed in the form of dried leaves or powder. They are typically smoked, using a pipe or by rolling in a cigarette paper, but can also be ingested as an infusion such as tea, or inhaled. The active ingredients in Spice and similar products are synthetic cannabinoids that act on brain cells to produce effects similar to those of THC, such as physical relaxation, changes in perception, elevated mood, and mild euphoria. These drugs may seem new to adults, but more than 1 in 10 American high school seniors (11.4%) report using synthetic marijuana in the prior year, according to the “Monitoring the Future” survey conducted by the University of Michigan. This level of use is four times the rate reported for inhalants or cocaine and eight times the rate for methamphetamine.

Spice and similar products have not been included in any wide-scale animal or human studies, and little information is available in international medical databases. The blends of ingredients vary widely, but these products typically contain more than a dozen different plant-derived compounds, which give rise to a wide variety of drug combinations. Calls to poison control centers for exposure to synthetic marijuana doubled between 2010 and 2011, with patients describing symptoms that include rapid heart rate, vomiting, agitation, confusion, and hallucinations. In March 2011 the U.S. Drug Enforcement Administration (DEA) banned five synthetic cannabinoids used in Spice and similar products.

“Bath salts,” marketed as cocaine or methamphetamine substitutes, are widely available on the Internet. They contain the synthetic stimulants mephedrone, methylone, or methylenedioxypyrovalerone (MDPV). Similar in effect to MDMA (“Ecstasy”), MDPV is a synthetic version of the active ingredient found in the stimulant khat, which is widely used in countries of the Middle East. The products are sold in small packets of salt-like crystals with warnings like “novelty only” and “not for human consumption.” Bath salts can be ingested by smoking, eating, or injecting the bath salts or by crushing them and snort-

ing the powder. The speed of onset is up to 15 minutes depending on how the drug is ingested, and the effects may last as long as six hours. The effects of bath salts can be severe and include combative violent behavior, extreme agitation, confusion, hallucinations, hypertension, chest pain, and suicidal thoughts. In 2010 poison centers in the United States received 304 calls about reactions to bath salts; the number rose to 6,138 calls in 2011. In September 2011 the DEA banned three of the drugs found in bath salts. Possession or sale of the chemicals or products that contain them is now illegal in the United States.

DRUG USE: THE DECADES AHEAD

Drug research will undoubtedly provide new information, new treatments, and new chemical combinations in the decades ahead. New psychoactive drugs may present unexpected possibilities for therapy, social use, and abuse. Making honest and unbiased information about drugs available to everyone, however, may cut down on their abuse.

Although the use of some drugs, both legal and illegal, has declined dramatically since the 1970s, the use of others has held steady or increased. Mounting public concern has led to great debate and a wide range of opinions about what should be done. Efforts to combat the problem include workplace drug testing, tougher law enforcement and prosecution, and treatment and education. With drugs entering the country on a massive scale from South America, Southeast Asia, and elsewhere, and being distributed through tightly controlled drug-smuggling organizations and street gangs, the success of any program is uncertain.

Drugs, Society, and Families

The economic cost of drug abuse is staggering. According to the Department of Justice, National Drug Intelligence Center, and Institute on Drug Abuse, the cost to society of illicit drug abuse alone is \$193 billion annually. That figure is higher than the cost of many major health problems, including diabetes, obesity, and smoking. But the costs are more than just financial—they are also paid in human pain and suffering.

The relationship between drugs and crime is complex: drug possession itself is a crime, some crimes are committed in order to obtain drugs, and some crimes are committed because of the loss of control associated with drug use. The criminal justice system is inundated with people accused of crimes related to drug possession, sale, or use. The FBI reports that more than 1.7 million arrests are made annually for drug violations. In 2009, the most recent year for which data are available, 18% of state prison inmates (252,000) were serving time for drug offenses. In 2010 about half of federal inmates (107,000) were in prison because of drug offenses. The Bureau of Justice Statistics reports that about half of all state and federal prisoners—roughly 850,000 men and women—meet diagnostic criteria for drug abuse or addiction. Many assaults and murders are committed when people try to acquire or protect drug territories,

settle disputes about drugs, or steal from dealers. Violence and gun use are common in neighborhoods where drug trafficking is prevalent. Addicts commit more robberies and burglaries than criminals not on drugs. People under the influence of drugs, especially alcohol, are more likely to commit violent crimes like rape and murder than people who do not use drugs.

Drug abuse is also a health care issue for society. In the United States, illegal drug use leads to more than 800,000 emergency department admissions and nearly 20,000 deaths annually. Although it is in the best interest of society to treat addicts who want help, there is not nearly enough space in treatment facilities to help the millions of Americans who need immediate treatment. Drug addicts who want to quit, especially those among the urban poor, often have to wait a year or more for acceptance into a residential care or other treatment program.

Drug abuse also takes a toll on individuals and families. Children born to women who use drugs such as alcohol, tobacco, or cocaine may have long-term health problems. Drug abuse in families can become a vicious cycle. Children who observe the adults around them using drugs assume it is acceptable. Abuse, neglect, lack of opportunity, and unemployment become contributing factors to drug use and perpetuate the cycle.

Legalizing Drugs

Pointing out that many of the social problems associated with drugs are related to prohibition rather than to the effects of the drugs themselves, some people have argued for various forms of drug legalization or decriminalization. Proposals range from making drugs such as marijuana and heroin available by prescription to allowing licensed dealers to sell some of these drugs to adults. Proponents argue that legalizing some currently illicit drugs—but putting controls on them similar to those used for alcohol, tobacco, and prescription drugs—could eliminate many problems. Some jurisdictions have adopted policies that make personal use and possession of small amounts of marijuana misdemeanor crimes without significant penalties. In 2010 California removed even the misdemeanor status of possession of less than an ounce of marijuana, making it an infraction comparable to a traffic ticket. A measure to legalize recreational marijuana use and allow it to be sold and taxed was placed on the ballot and defeated in California in November 2010.

Opponents of drug legalization argue that allowing easier access to drugs would expose many more people to possible abuse and dependence. Drugs would be cheaper and easier to obtain, and drug use would be more socially acceptable. Legalizing drugs could cause an increase in drug use among children and teenagers. Opponents point out that alcohol and tobacco—drugs that already are legal—are major causes of disease and death in our society.

Many American businesses require workers to take drug tests; a substantial number of employers offer counseling and treatment support for workers who test positive.

Drug Testing

The workplace is another segment of our society where drug use is common. According to data from recent surveys, the majority of substance users hold full-time jobs. Drug use in the workplace not only creates health problems for individual users, but also has a negative effect on productivity and on safety of coworkers.

Statistics from the federal government show that 8.4% of full-time workers were illicit drug users in 2007, the most recent year for which data are available. In absolute numbers, approximately 13.1 million current illicit drug users and 13 million heavy alcohol users were full-time workers in 2007. Illicit

drug use is highest among workers in the food industry and construction sectors, while heavy alcohol use is greatest among construction, mining, and repair workers. The economic burden of lost productivity resulting from premature death, illness, and disability is estimated to run as high as \$114 billion for drug abuse and \$179 billion for heavy alcohol use.



Many companies test current and prospective employees for drug use.

DIVERSITY MATTERS

Drug Use and Ethnicity



Surveys of the U.S. population find a variety of trends in drug use and abuse among ethnic groups (see the accompanying table). In addition to these general trends, there are also trends relating to specific drugs. For example, cocaine use is more prevalent among whites than among other groups, and hallucinogen use is more prevalent among American Indians and Alaska Natives.

However, as is true for many areas of health, ethnic trends are influenced by a complex interplay of other factors:

- **Educational status:** Adults with four or more years of college are more likely to have *tried* illicit drugs than are people of the same age who never finished high school. *Current* drug use, however, is lower among college graduates than among people with less education. Among teens, poor school performance is associated with a higher risk of drug use.
- **Employment status:** Most adult drug users are employed, but rates of current drug use are much higher among people who are unemployed or who work part-



LIFETIME AND PAST MONTH ILLICIT DRUG USE AMONG PEOPLE AGED 12 OR OLDER

	NATIONAL SURVEY RESULTS, 2010	
	LIFETIME DRUG USE (PERCENT)	PAST MONTH DRUG USE (PERCENT)
White	50.7	9.1
Black or African American	46.1	10.7
Hispanic or Latino	36.4	8.1
Asian American	21.2	3.5
American Indian and Alaska Native	57.6	N/A
Native Hawaiian and Pacific Islander American	N/A	N/A
Two or more races	56.1	22.2

NOTE: Results shown in percentages of each population group.

N/A = Data not available.

time compared with those who are employed full-time.

- **Parental education and socioeconomic status:** Students from poor families have higher rates of *early* drug use compared with students from wealthier families. By the 12th grade the differences disappear. Socioeconomic status and parental education are closely linked.
- **Geographic area:** Current drug use in the United States is highest in the West and Midwest; drug use is also higher in metropolitan and urban areas compared with more rural areas. People living in communities with high rates of poverty, crime, and unemployment have higher-than-average rates of drug use and abuse. Specific drugs may also be more available—and their abuse more prevalent—in certain regions or communities.

Strong cultural identity is associated with reduced risk of drug use and abuse among all groups. The following factors may contribute to lower rates of drug use among such groups:

- **Parental and community disapproval of drug and alcohol use:** Parents of Asian American children tend to have more restrictive drug and alcohol use norms than African American and white parents. Black parents tend to monitor their children's

activities and friendships more closely than white parents. Parental disapproval of drug use is often tied to greater perceived risk of drug use—and lower rates of drug use—among teens.

- **Close family ties:** Asian American teens are the likeliest to come from intact homes. Respect for authority and family loyalty are strongly valued among many Asian American populations. Black teens, although least likely to come from intact homes, often come from single-parent households with close extended family ties. Teens from cohesive and stable families are less likely to use drugs.

- **Focus on schooling and education:** Teens from families who value education and where parents help with homework and limit weeknight time with friends have lower rates of drug use. Asian Americans have twice the rate of college graduation compared with other groups.

SOURCES: Johnston, L. D., et al. 2012. *Monitoring the Future: Overview of Key Findings, 2011*. Ann Arbor, MI: Institute for Social Research, The University of Michigan; Substance Abuse and Mental Health Services Administration. 2011. *Results from the 2010 National Survey on Drug Use and Health: National Findings*. Rockville, MD: Office of Applied Studies, NSDUH Series H-36, HHS Publication No. SMA 11-4434.

connect
ACTIVITY
DO IT ONLINE

The extent of the problem has given rise to the development of workplace policies to help workers regain their health and well-being. Workplace policies developed to address the problem often include drug testing and referral services. Despite controversial aspects of drug testing in the workplace, a growing number of U.S. workers recognize the need for such screening.

Most drug testing involves a urine test. A test for alcohol involves a blood test or a breath test. The accuracy of these tests has improved in recent years, so there are fewer opportunities for people to cheat or for the tests to yield inaccurate results. If a person tests positive for drugs, the employer may provide drug counseling or treatment, suspend the employee until he or she tests negative, or fire the individual.

The FDA has approved several over-the-counter home drug testing kits designed to allow parents to check their children for drug use. Urine samples are collected at home, and preliminary results may be available immediately, but final results require that the sample be sent to a laboratory for analysis. Many experts, including the American Academy of Pediatrics, advise against the use of home tests in cases of suspected drug use. Instead they recommend a comprehensive evaluation by a qualified health care professional.

Treatment for Drug Addiction

Treatment for drug addiction often is characterized by discrete and repeated episodes of short-term abstinence and relapse. Regardless of the therapeutic approach used, many individuals undergoing treatment will often slide back into their drug habits. Often this backsliding results in worsening of the original substance abuse problem. For some substances, relapse occurs within one year after treatment.

Preventing relapse and maintaining long-term cessation of drug use is an exceedingly complex medical goal. Medical interventions based on pharmaceutical aids to enhance the individual's long-term commitment to change and stay drug-free remain a distant and elusive goal. Relapse prevention research is instead increasingly focusing on expanding the repertoire of behavioral skills individuals need to decrease the risk of recidivism.

Medication-Assisted Treatment Medications are increasingly being used in addiction treatment to reduce the craving for the abused drug or to block or oppose its effects. Perhaps the best-known medication for drug abuse is methadone, a synthetic drug used as a substitute for heroin. Methadone prevents withdrawal reactions and reduces the craving for heroin. Its use enables heroin-addicted people to function normally in social and vocational activities, although they remain dependent on methadone. The drug buprenorphine, approved for treatment of opioid addiction, also reduces

cravings. Many other medications are under study; drugs used specifically in the treatment of nicotine and alcohol dependence are discussed in Chapters 10 and 11.

Medication therapy is relatively simple and inexpensive and is therefore popular among patients, health care providers, and insurance companies. However, the relapse rate is high. Combining drug therapy with psychological and social services improves success rates, underscoring the importance of psychological factors in drug dependence.

Treatment Centers Treatment centers offer a variety of short-term and long-term services, including hospitalization, detoxification, counseling, and other mental health services. The therapeutic community is a specific type of center, a residential program run in a completely drug-free atmosphere. Administered by ex-addicts, these programs use confrontation, strict discipline, and unrelenting peer pressure to attempt to resocialize the addict with a different set of values. Halfway houses, which are transitional settings between a 24-hour-a-day program and independent living, are an important phase of treatment for some people. Strategies for evaluating programs are given in the box "Choosing a Drug Treatment Program."

Groups and Peer Counseling Groups such as Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) have helped many people. People treated in drug substitution programs or substance abuse treatment centers are often urged or required to join a self-help group as part of their recovery. These groups follow a 12-step program. Group members' first step is to acknowledge that they have a problem over which they have no control. Peer support is a critical ingredient of these programs, and members usually meet at least once a week. Each member is paired with a sponsor to call on for advice and support if the temptation to relapse becomes overwhelming. With such support, thousands of substance-dependent people have been able to recover, remain abstinent, and reclaim their lives. Chapters of AA and NA meet on some college campuses; community-based chapters are listed in the phone book and in local newspapers.

Many colleges also have peer counseling programs, in which students are trained to help other students who have drug problems. A peer counselor's role may be as limited as referring a student to a professional with expertise in substance dependence for an evaluation or as involved as helping arrange a leave of absence from school for participation in a drug treatment program. Most peer counseling programs are founded on principles of strict confidentiality. Peer counselors may also be able to help students who are concerned about a classmate or loved one with an apparent drug problem (see the box "If Someone You Know Has a Drug Problem . . ."). Information

QUICK STATS

In 2010, 4.1 million people aged 12 or older received treatment for a problem related to the use of alcohol or illicit drugs.

—NSDUH, 2011

CRITICAL CONSUMER

Choosing a Drug Treatment Program



When evaluating different facilities or programs for drug treatment, consider the following issues:

- *What type of treatment or facility is most appropriate?* Intensive outpatient treatment is available through many community mental health centers, as well as through specialized drug treatment facilities. Such programs typically require several sessions per week, combining individual therapy, group counseling, and attendance at 12-step meetings. Residential, or inpatient, facilities may be associated with a medical facility such as a hospital, or they may be freestanding programs that focus solely on substance abuse treatment. Some residential treatment programs last longer or cost more per week than many health insurance plans will cover.
- *How will treatment be paid for?* Many health insurance plans limit residential treatment to a maximum of three or fewer weeks. They may also require that you first attempt a less expensive form of treatment before they will approve coverage for a residential facility.
- *Is there likely to be a need for medical support?* Chronic alcoholics or abusers of other CNS depressants may experience life-threatening seizures or other withdrawal symptoms during the first few days

of detoxification. Malnutrition is common among substance abusers, and injection drug users may suffer from local infections and bloodborne diseases such as hepatitis or HIV infection. Medical problems such as these are best handled in an inpatient program with good medical support.

- *What is the level of professional training of the staff?* Is there a medical doctor on-site or making frequent visits? Are there trained nurses? Licensed psychologists or social workers? Many successful programs are staffed primarily by recovering alcoholics or drug users. Those staff members should have training and certification as addiction specialists.
- *Does the program provide related services, such as family and job counseling and posttreatment follow-up?* These types of services are extremely important for the long-term success of drug abuse treatment.
- *Can you visit the facility and speak with the staff and clients?* A prospective client and his or her family should be allowed to visit any treatment center or program.

about peer counseling programs is usually available from the student health center.

Harm Reduction Strategies Because many attempts at treatment are at first unsuccessful, some experts advocate the use of harm reduction strategies. The goal of harm reduction is to minimize the negative effects of drug use and abuse: a common example is the use of designated drivers to reduce alcohol-related motor vehicle crashes. Drug substitution programs such as methadone maintenance are a form of harm reduction—although participants remain drug dependent, the negative individual and social consequences of their drug use are reduced. Syringe exchange programs, designed to reduce transmission of HIV and hepatitis C, are another harm reduction approach. Some experts have also suggested free testing of street drugs for purity and potency to help users avoid unintentional toxicity or overdose.

Codependency Many treatment programs also offer counseling for those who are close to drug abusers. Drug abuse takes a toll on friends and family members, and coun-

seling can help people work through painful feelings of guilt and powerlessness. **Codependency**, in which a person close to the drug abuser is controlled by the abuser's behavior, sometimes develops. Codependent people may come to believe that love, approval, and security are contingent on their taking care of the abuser. People can become codependent naturally because they want to help when someone they love becomes dependent on a drug. They may assume that their good intentions will persuade the drug user to stop.

Codependent people often engage in behaviors that remove or soften the effects of drug use on the user—so-called *enabling* behaviors. The habit of enabling can inhibit a drug abuser's recovery because the person never has to experience the consequences of his or her behavior. Often the enabler is dependent, too—on the patterns of interaction in the relationship. People who need to take care of others often marry people who need to be taken care of. Children in these families often develop the same behavior pattern as one of their parents—either becoming helpless or becoming a caregiver. For this reason, many treatment programs involve the whole family.

Have you ever been an enabler in a relationship? You may have if you've ever done any of the following:

- Given someone one more chance to stop abusing drugs, then another, and another
- Made excuses or lied for someone to his or her friends, teachers, or employer

codependency A relationship in which a non-substance-abusing partner or family member is controlled by the abuser's behavior; codependent people frequently engage in enabling behaviors.

TERMS



TAKE CHARGE

If Someone You Know Has a Drug Problem . . .

Changes in behavior and mood in someone you know may signal a growing dependence on drugs. Signs that a person's life is beginning to focus on drugs include the following:

- Sudden withdrawal or emotional distance
- Rebellious or unusually irritable behavior
- A loss of interest in usual activities or hobbies
- A decline in school performance
- A sudden change in the chosen group of friends
- Changes in sleeping or eating habits
- Frequent borrowing of money or stealing
- Secretive behavior about personal possessions, such as a backpack or the contents of a drawer
- Deterioration of physical appearance

If you believe a family member or friend has a drug problem, locate information about drug treatment resources available on campus or in your community. Communicate your concern, provide him or her with information about treatment options, and offer your support during treatment. If the person continues to deny having a problem, talk with an experienced counselor about setting up an intervention—a formal, structured confrontation designed to end denial by having family, friends, and other caring people present their concerns to the drug user. Participants in an intervention would indicate the ways in which the individual is hurting others as well as himself or herself. If your friend or family member agrees to treatment, encourage him or her to attend a support group such as Narcotics Anonymous or Alcoholics Anonymous.

And finally, examine your relationship with the abuser for signs of codependency. If necessary, get help for yourself; friends and family of drug users can often benefit from counseling.

- Joined someone in drug use and blamed others for your behavior
- Lent money to someone to continue drug use
- Stayed up late waiting for or gone out searching for someone who uses drugs
- Felt embarrassed or angry about the actions of someone who uses drugs
- Ignored the drug use because the person got defensive when you brought it up
- Avoided confronting a friend or relative who was obviously intoxicated or high on a drug

If you come from a codependent family or see yourself developing codependency relationships or engaging in enabling behaviors, consider acting now to make changes in your patterns of interaction. Remember, you cannot cause or cure drug dependence in another person.

Preventing Drug Abuse

Obviously the best solution to drug abuse is prevention. Government attempts at controlling the drug problem have historically focused on stopping the production, importation, and distribution of illegal drugs. A new national drug policy announced in 2010, however, redirects federal funding and efforts into stopping the demand for drugs. Developing persuasive antidrug educational programs may offer the best hope for solving the drug problem in the future. Indirect approaches to prevention involve building young people's

self-esteem, improving their academic skills, and increasing their recreational opportunities. Direct approaches involve providing information about the adverse effects of drugs and teaching tactics that help students resist peer pressure to use drugs in various situations. Developing strategies for resisting peer pressure is one of the more effective techniques.

Prevention efforts need to focus on the different motivations individuals have for using and abusing specific drugs at different ages. For example, grade-school children seem receptive to programs that involve their parents or well-known adults such as professional athletes. Adolescents in junior or senior high school are often more responsive to peer counselors. Many young adults tend to be influenced by efforts that focus on health education. For all ages, it is important to provide nondrug alternatives—such as recreational facilities, counseling, greater opportunities for leisure activities, and places to socialize—that speak to the individual's or group's specific reasons for using drugs. Reminding young people that most people, no matter what age, are *not* users of illegal drugs, do *not* smoke cigarettes, and do *not* get drunk frequently is a critical part of preventing substance abuse.

Ask Yourself

Do you know someone who may have a drug problem?
What steps, if any, have you taken to help that person?
If you were using drugs and felt that things had gone out of control, what would you want your friends to do for you?



Connect to Your Choices

Have you ever thought about why you make the choices you do about drugs? Many factors can influence the drug-related choices we make, some not as obvious as others. If you use drugs—or if you don’t—have you been influenced by attitudes toward drug use in your family or peer group? Do you take drugs when they’re offered at parties because it’s easier than saying no? Are you influenced by the lyrics of songs that make drug use sound glamorous?

What are the external factors that influence your drug-related choices? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

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TIPS FOR TODAY AND THE FUTURE

RIGHT NOW YOU CAN:

- If you are a regular caffeine user, look for ways to cut back.
- Consider whether you or someone you know might benefit from drug counseling. Find out what types of services are available on campus or in your area.

IN THE FUTURE YOU CAN:

- Think about the drug-related attitudes of people you know. For example, talk to two older adults and two fellow students about their attitudes toward legalizing marijuana. What are the differences in their opinions, and how do they account for them?
- Analyze media portrayals of drug use. As you watch TV shows and movies, note the way they depict drug use among people of different ages and backgrounds. How realistic are the portrayals, in your view? Think about the influence they have on you and your peers.

SUMMARY

- Addictive behaviors are self-reinforcing. Addicts experience a strong compulsion for the behavior and a loss of control over it; an escalating pattern of abuse with serious negative consequences may result.
- The sources or causes of addiction include heredity, personality, lifestyle, and environmental factors. People may use an addictive behavior as a means of alleviating stress or painful emotions.
- Some common behaviors are potentially addictive, including gambling, shopping, sexual activity, Internet use, eating, and working.

- Drug abuse is a maladaptive pattern of drug use that persists despite adverse social, psychological, or medical consequences.

- Drug addiction involves taking a drug compulsively, which includes neglecting constructive activities because of it and continuing to use it despite experiencing adverse effects resulting from its use. Tolerance and withdrawal symptoms are often present.

- Reasons for using drugs include the lure of the illicit; curiosity; rebellion; peer pressure; and the desire to alter one’s mood or escape boredom, anxiety, depression, or other psychological problems.

- Psychoactive drugs affect the mind and body by altering brain chemistry. The effect of a drug depends on its properties and on how it’s used (drug factors), the physical and psychological characteristics of the user (user factors), and the physical and social environment surrounding the drug use (social factors).

- Opioids relieve pain, cause drowsiness, and induce euphoria; they reduce anxiety and produce lethargy, apathy, and an inability to concentrate.

- CNS depressants slow down the overall activity of the central nervous system; they reduce anxiety and cause mood changes, impaired muscular coordination, slurring of speech, and drowsiness or sleep.

- CNS stimulants speed up the activity of the central nervous system, causing acceleration of the heart rate, a rise in blood pressure, dilation of the pupils and bronchial tubes, and an increase in gastric and adrenal secretions.

- Marijuana usually causes euphoria and a relaxed attitude at low doses; very high doses produce feelings of depersonalization and sensory distortion. The long-term effects may include chronic bronchitis and cancer; use during pregnancy may impair fetal growth.

- Hallucinogens alter perception, feelings, and thoughts and may cause an altered sense of time, visual disturbances, and mood changes.

- Inhalants are present in a variety of everyday products; they can cause delirium. Their use can lead to loss of consciousness, heart failure, suffocation, and death.

- Economic and social costs of drug abuse include the financial costs of law enforcement, treatment, and health care and the social costs of crime, violence, and family problems. Drug testing and drug legalization have been proposed to address some of the problems related to drug abuse.

- Approaches to treatment include medication, treatment centers, self-help groups, and peer counseling; many programs also offer counseling to family members.

FOR MORE INFORMATION

BOOKS

Aue, P. W. 2007. *Teen Drug Abuse: Opposing Viewpoints*. San Diego: Greenhaven Press. *Explores key issues relating to drug use and abuse by teenagers.*

Hanson, G. R., et al. 2008. *Drugs and Society*, 10th ed. Boston: Jones & Bartlett. *Discusses the impact of drug abuse on individuals’ lives and on the broader society.*

Ksir, C., C. L. Hart, and O. S. Ray. 2010. *Drugs, Society, and Human Behavior*, 14th ed. New York: McGraw-Hill. Examines drugs and behavior from the behavioral, pharmacological, historical, social, legal, and clinical perspectives.

Lessa, N. R., et al. 2006. *Wiley Concise Guides to Mental Health: Substance Use Disorders*. New York: Wiley. A clearly written introduction to the diagnosis and treatment of various kinds of substance abuse.

Murphy, P. J. M., and M. Shlafer. 2006. *Over-the-Counter Drugs of Abuse*. New York: Chelsea House Publications. An up-to-date discussion of nonprescription medicines and their abuse.

Rosen Publishing. 2009. *Drug Abuse and Society Series*. New York: Rosen Publishing. A series of short books, each exploring a different type of drugs—from prescription medicine to club drugs—and their use and abuse.

ORGANIZATIONS, HOTLINES, AND WEBSITES

Club Drugs. Provides information about drugs commonly classified as “club drugs.”

<http://www.drugabuse.gov/drugs-abuse/club-drugs>

Do It Now Foundation. Provides youth-oriented information about drugs.

<http://www.doitnow.org>

Drug Enforcement Administration: Drug Information. Provides basic facts about major drugs of abuse, including penalties for drug trafficking.

<http://www.justice.gov/dea/concern/concern.htm>

Gamblers Anonymous. Includes questions to help diagnose gambling problems and resources for getting help.

<http://www.gamblersanonymous.org/ga/>

Higher Education Center for Alcohol and Other Drug Abuse and Violence Prevention. Gives information about alcohol and drug abuse on campus and links to related sites.

<http://www.higheredcenter.org>

Indiana Prevention Resource Center. A clearinghouse of information on substance abuse topics, including specific psychoactive drugs and issues such as drug testing and drug legalization.

<http://www.drugs.indiana.edu>

Narcotics Anonymous (NA). Similar to Alcoholics Anonymous, NA sponsors 12-step meetings and provides other support services for drug abusers.

<http://www.na.org>

There are also 12-step programs that focus on specific drugs:

Cocaine Anonymous

<http://www.ca.org>

Marijuana Anonymous

<http://www.marijuana-anonymous.org>

National Center on Addiction and Substance Abuse (CASA) at Columbia University. Provides information about the costs of substance abuse to individuals and society.

<http://www.casacolumbia.org>

National Council on Problem Gambling. Provides information and help for people with gambling problems and their families, including a searchable directory of counselors.

<http://www.ncpgambling.org>

National Drug Information, Treatment, and Referral Hotlines. Sponsored by the SAMHSA Center for Substance Abuse Treatment, these hotlines provide information on drug abuse and on HIV infection

as it relates to substance abuse; referrals to support groups and treatment programs are available.

800-662-HELP

800-729-6686 (Spanish)

800-487-4889 (TDD for hearing impaired)

National Institute on Drug Abuse. Develops and supports research on drug abuse prevention programs.

<http://www.drugabuse.gov>

Substance Abuse and Mental Health Services Administration (SAMHSA). Provides statistics, information, and other resources related to substance abuse prevention and treatment.

<http://www.samhsa.gov>

See also the listings for Chapters 10 and 11.

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BEHAVIOR CHANGE STRATEGY

Changing Your Drug Habits

This behavior change strategy focuses on one of the most commonly used drugs—caffeine. If you are concerned about your use of a different drug or another type of addictive behavior, you can devise your own plan based on this one and on the steps outlined in Chapter 1.

Like many Americans, you may find yourself relying on coffee (or tea, chocolate, or cola) to get through a busy schedule. When you are studying for exams, for example, the forced physical inactivity and the need to concentrate even when fatigued may lead you to overuse caffeine. But caffeine doesn't help unless you are already sleepy. And it does not relieve any underlying condition (you are just more tired when it wears off). How can you change this pattern?

Self-Monitoring

Keep a log of how much caffeine you eat or drink. Be sure to include all forms, such as chocolate and OTC medications, as well as colas, tea, and coffee. Using Table 9.6, convert the amounts you drink into an estimate expressed in milligrams of caffeine.

Self-Assessment

At the end of the week, add up your daily totals and divide by 7 to get your daily average in milligrams. At more than 250 mg per day, you may be experiencing some adverse symptoms. If you are experiencing at least five of the following symptoms, you may want to cut down:

- Restlessness
- Nervousness

- Excitement
- Insomnia
- Flushed face
- Excessive sweating
- Gastrointestinal problems
- Muscle twitching
- Rambling thoughts and speech
- Irregular heartbeat
- Periods of inexhaustibility
- Excessive pacing or movement

Set Limits

Can you restrict your caffeine intake to a daily total, and stick to this contract? If so, set a cutoff point, such as the amount of caffeine in one cup of coffee. If you cannot stick to your limit, you may want to cut out caffeine altogether: abstinence can be easier than moderation for some people. If you experience caffeine withdrawal symptoms (headache, fatigue), you may want to cut your intake more gradually.

Find Other Ways to Keep Up Your Energy

Get enough sleep or exercise more, rather than drowning the problem in coffee or tea. Remember that exercise raises your metabolic rate for hours afterward—a handy fact to exploit when you need to feel more awake and want to avoid an irritable caffeine jag. And if you've been compounding your fatigue by not eating properly, try filling up on



complex carbohydrates such as whole-grain bread or crackers instead of candy bars.

Tips for Cutting Out Caffeine

Here are some more ways to decrease your consumption of caffeine:

- Keep some noncaffeinated drinks on hand.
- Alternate between hot and very cold liquids.
- Fill your coffee cup only halfway.
- Avoid the office or school lunchroom or cafeteria and the chocolate sections of the grocery store. (Often people drink coffee or tea and eat chocolate simply because they're available.)
- Read labels of over-the-counter medications to check for hidden sources of caffeine.



Alcohol Use and Alcoholism

LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain how alcohol is absorbed and metabolized by the body
- Describe the immediate and long-term effects of drinking alcohol
- Define moderate alcohol consumption and discuss its possible benefits
- Describe the different forms of alcohol abuse and their consequences
- Evaluate the role of alcohol in your life, and list strategies for using it responsibly

TEST YOUR KNOWLEDGE

1. "Moderate drinking" is having three or fewer drinks per day.
True or false?
2. If a man and a woman of the same weight drink the same amount of alcohol, the woman will become intoxicated more quickly than the man.
True or false?
3. Drinking too much alcohol in too short a time can cause death from alcohol poisoning.
True or false?
4. Drinking coffee will help you sober up.
True or false?

ANSWERS

1. **FALSE.** Moderate drinking is having no more than one drink per day for women and no more than two drinks per day for men.
2. **TRUE.** Women are usually smaller than men, have a higher percentage of body fat, and have a less active form of a stomach enzyme that breaks down alcohol. These factors cause them to become intoxicated more quickly and to a greater degree.
3. **TRUE.** Having a number of drinks over a period of several hours is likely to cause intoxication, followed by a hangover; chugging the same amount in an hour or less can be lethal.
4. **FALSE.** Once alcohol has been absorbed by the body, nothing speeds its metabolism.

Throughout history, alcohol has been the most popular psychoactive drug in the Western world, despite numerous prohibitions against it. Alcohol has a contradictory role in human life. Used in moderation, alcohol can enhance social occasions by loosening inhibitions and creating a pleasant feeling of relaxation. But alcohol use can also be unhealthful. Like other drugs, alcohol has physiological effects that can impair functioning in the short term and cause devastating damage in the long term. For some people, alcohol use becomes an addiction, leading to a lifetime of recovery or, for a few, to debilitation and death.

The use of alcohol is a complex issue, one that demands conscious thought and informed decisions. In our society, some people choose to drink in moderation while some choose not to drink at all. Still others realize too late that they've chosen unwisely—when they become dependent on alcohol, are involved in an alcohol-related car crash, or simply wake up to discover they've done something they regret.

This chapter discusses the complexities of alcohol use and provides information that will help you make choices that are right for you.

THE NATURE OF ALCOHOL

If you have ever been around people who are drinking, you probably noticed that alcohol seems to affect different people in different ways. One person may seem to get drunk after just a drink or two, while another appears to tolerate a great deal of alcohol without becoming intoxicated. These differences make alcohol's effects on the body seem mysterious and help explain why many misconceptions have evolved about alcohol use. The following sections explain how alcohol works in the body.

Alcoholic Beverages

Technically speaking, there are many kinds of **alcohol**, and each is an organic compound. In this book, however, the term *alcohol* refers only to ethyl alcohol (or ethanol, often abbreviated as ETOH). Several kinds of alcohol are similar to ethyl alcohol, such as methanol (wood alcohol) and isopropyl alcohol (rubbing alcohol), but they are highly toxic; if consumed, these forms of alcohol can cause serious illness, blindness, and even death.

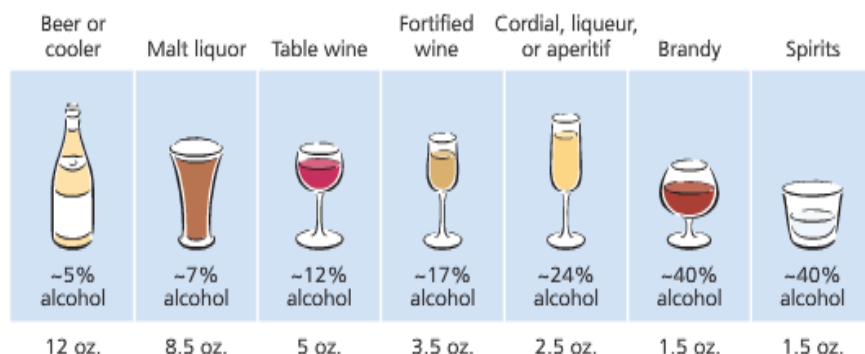


FIGURE 10.1 One drink of various alcoholic beverages.

SOURCE: Department of Health and Human Services. 2007. *The Surgeon General's Call to Action to Prevent and Reduce Underage Drinking*. Washington, DC: Department of Health and Human Services, Office of the Surgeon General.

Common Alcoholic Beverages There are several basic types of alcoholic beverages. Ethanol is the psychoactive ingredient in each of them:

- Beer is a mild intoxicant brewed from a mixture of grains. By volume, beer usually contains 3–6% alcohol.
- Ales and malt liquors, which are similar to beer, typically contain 6–8% alcohol by volume.
- Wines are made by fermenting the juices of grapes or other fruits. During *fermentation*, sugars from the fruit react with yeast to create ethanol and other by-products. In table wines, the concentration of alcohol is about 9–14%. A more potent type of wine, called *fortified wine*, is so called because extra alcohol is added during its production. Fortified wines—such as sherry, port, and Madeira—contain about 20% alcohol.
- Hard liquor—such as gin, whiskey, rum, tequila, vodka, and liqueur—is made by *distilling* brewed or fermented grains or other plant products. Hard liquors usually contain 35–50% alcohol but can be much stronger.

The concentration of alcohol in a beverage is indicated by its **proof value**, which is two times the percentage concentration. For example, if a beverage is 100 proof, it contains 50% alcohol by volume. Two ounces of 100-proof whiskey contain one ounce of pure alcohol. The proof value of hard liquor can usually be found on the bottle's label.

“Standard Drinks” versus Actual Servings When discussing alcohol consumption, the term **one drink** (or a *standard drink*) means the amount of a beverage that typically contains about 0.6 ounce of alcohol. Figure 10.1 shows the amounts of popular beverages that are considered to be one standard drink, based on their alcohol content.

People don't always limit themselves to one drink. In fact, a typical serving of most alcoholic beverages is larger (sometimes significantly larger) than a single standard drink. This is particularly true of mixed drinks, which often include more than one type of hard liquor. Alcoholic beverages are usually sold in packages that contain multiple servings, as shown in Table 10.1.

Caloric Content Alcohol provides 7 calories per gram, and the alcohol in one drink (14–17 grams) supplies about 100–120 calories. Most alcoholic beverages also contain some

carbohydrate; for example, one beer provides about 150 total calories. The “light” in light beer refers to calories; a light beer typically has close to the same alcohol content as a regular beer and about 100 calories. A 5-ounce glass of red wine has 100 calories; white wine has 96. A 3-ounce margarita supplies 157 calories, a 6-ounce cosmopolitan has 143 calories, and a 6-ounce rum and Coke contains about 180 calories.

alcohol The intoxicating ingredient in fermented or distilled beverages; a colorless, pungent liquid.

TERMS

proof value Two times the percentage of alcohol, by volume, in an alcoholic beverage; a “100-proof” beverage is 50% alcohol by volume.

one drink The amount of a beverage that typically contains about 0.6 ounce of alcohol; also called a *standard drink*.

Table 10.1 Serving Sizes versus Standard Drinks of Common Alcoholic Beverages

BEVERAGE	SERVING/ CONTAINER SIZE	NO. OF STANDARD DRINKS
Beer	12 oz.	1
	16 oz.	1.3
	22 oz.	2
	40 oz.	3.3
Malt liquor	12 oz.	1.5
	16 oz.	2
	22 oz.	2.5
	40 oz.	4.5
Table wine	750 mL (25 oz.) bottle	5
Hard liquor (80 proof)	1 mixed drink	1 or more
	1 pint (16 oz.) bottle	11
	1 fifth (25 oz.) bottle	17
	1.75 L (59 oz.) bottle	39

SOURCE: Department of Health and Human Services. 2007. *The Surgeon General's Call to Action to Prevent and Reduce Underage Drinking*. Washington, DC: Department of Health and Human Services, Office of the Surgeon General.



DIVERSITY MATTERS

Metabolizing Alcohol: Our Bodies Work Differently

Do you and your friends react differently to alcohol? If so, your reactions may be affected by genetic differences in alcohol metabolism associated with ethnicity. Alcohol is metabolized mainly in the liver, where it is converted by an enzyme, alcohol dehydrogenase, into a toxic substance called acetaldehyde. Acetaldehyde causes many of alcohol's noxious effects. Ideally it is quickly broken down to a less active by-product, acetate, by another enzyme, acetaldehyde dehydrogenase (ALDH). Acetate can then separate into water and carbon dioxide and easily be eliminated.

Some people, primarily those of Asian descent, inherit ineffective or inactive variations of that latter enzyme, acetaldehyde dehydrogenase. Others, including some of African and Jewish descent, have forms of alcohol dehydrogenase that metabolize alcohol to acetaldehyde very quickly. Either way, toxic acetaldehyde builds up when these people drink alcohol. They experience a reaction called *flushing syndrome*. Their skin feels hot, their heart and respiration rates increase, and they may get a headache, vomit, or break out in hives. Their reaction's severity is affected by the inherited form of their alcohol-metabolizing enzymes. Drinking makes some people so uncomfortable that they are unlikely to develop alcohol addiction.

The body's response to acetaldehyde is the basis for treating alcohol abuse with the drug disulfiram (Antabuse), which inhibits the action of acetaldehyde dehydrogenase. When a person taking disulfiram ingests alcohol, acetaldehyde levels increase rapidly, and he or she develops an intense flushing reaction along with weakness, nausea, vomiting, and other disagreeable symptoms.

How people behave in relation to alcohol is influenced in complex ways by a wide range of factors, including liver size, body mass, and social and cultural influences. But individual choices and behavior are strongly influenced by specific genetic characteristics.

connect
ACTIVITY
DO IT ONLINE

Absorption

When a person ingests alcohol, about 20% is rapidly absorbed from the stomach into the bloodstream. About 75% is absorbed through the upper part of the small intestine. Any remaining alcohol enters the bloodstream farther along the gastrointestinal tract. Once in the bloodstream, alcohol produces sensations of intoxication.

The rate of absorption is affected by a variety of factors. For example, the carbonation in a beverage like champagne increases the rate of alcohol absorption. Artificial sweeteners (commonly used in drink mixers) have the same effect. Food in the stomach slows the rate of absorption, as does the drinking of highly concentrated alcoholic beverages such as hard liquor. But remember: *all* alcohol a person consumes is eventually absorbed.

Metabolism and Excretion

The circulatory system quickly transports alcohol throughout the body. Because alcohol easily moves through most biological membranes, it is rapidly distributed throughout most body tissues. Alcohol **metabolizes** mainly in the liver, though a small amount of alcohol is metabolized in the stomach. Alco-

hol can be metabolized by several processes. Most is converted first to acetaldehyde, then to acetate, which is ultimately burned for energy or converted to fat. The enzymes needed for this process vary slightly among individuals, creating differences in how people react to alcohol. (See the box "Metabolizing Alcohol: Our Bodies Work Differently.")

About 2–10% of ingested alcohol is not metabolized in the liver or other tissues but is excreted unchanged by the lungs, kidneys, and sweat glands. Excreted alcohol causes the telltale smell on a drinker's breath and is the basis of breath and urine analyses for alcohol levels. Although such analyses do not give precise measurements of alcohol concentrations in the blood, they provide a reasonable approximation if done correctly.

Alcohol readily enters the human brain, crossing the restrictive layer of cells that ordinarily shields it. There alcohol affects neurotransmitters—the chemicals that carry messages between brain cells. Alcohol changes the ability of brain cells to receive these messages and disrupts networks within the brain that connect different brain regions. These changes are temporary, creating many of the immediate effects of drinking alcohol.

With chronic heavy usage, however, alcohol's effects become permanent, resulting in permanent disruption of brain function and changes in brain structure. Alcohol interferes with the production of new brain cells in unborn children, young children, adolescents, and young adults, in whom the brain continues to develop until about age 21. Even in mature adults, new brain cells are produced to replace damaged ones, and alcohol is likely to affect that process as well.

metabolism The chemical transformation of food and other substances in the body into energy and wastes.

TERMS

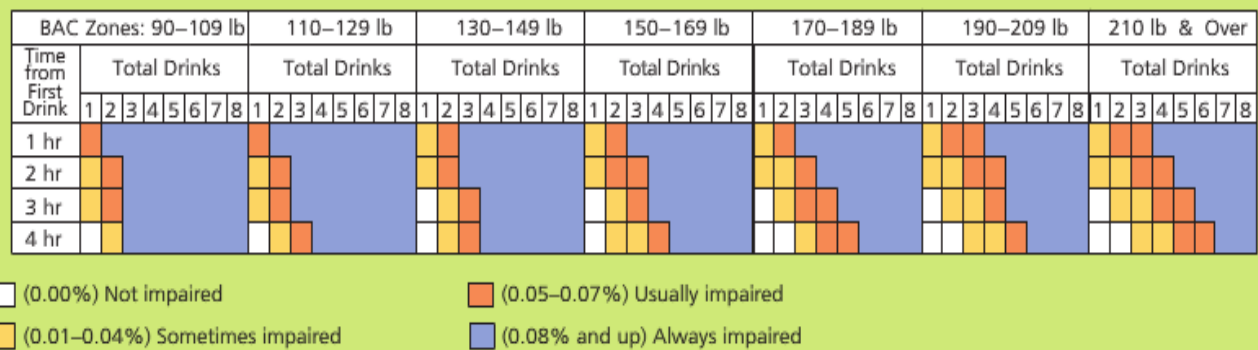


FIGURE 10.2 Approximate blood alcohol concentration and body weight. This chart illustrates the BAC an average person of a given weight would reach after drinking the specified number of drinks in the time shown. The legal limit for BAC is 0.08%; for drivers under 21 years of age, many states have zero-tolerance laws that set BAC limits of 0.01% or 0.02%.

Alcohol Intake and Blood Alcohol Concentration

Blood alcohol concentration (BAC) is the ratio of alcohol in a person's blood by weight, expressed as the percentage of alcohol measured in a deciliter of blood. BAC is affected by the amount of alcohol consumed in a given amount of time and by individual factors:

- **Body weight:** In most cases, a smaller person develops a higher BAC than a larger person after drinking the same amount of alcohol (Figure 10.2). A smaller person has less overall body tissue into which alcohol can be distributed.
- **Percentage of body fat:** A person with a higher percentage of body fat will usually develop a higher BAC than a more muscular person of the same weight. Alcohol does not concentrate as much in fatty tissue as in muscle and most other tissues, in part because fat has fewer blood vessels.
- **Sex:** Women metabolize less alcohol in the stomach than men do because the stomach enzyme that breaks down alcohol before it enters the bloodstream is four times more active in men than in women. This means that more unmetabolized alcohol is released into the bloodstream in women. Because women are also generally smaller than men and have a higher percentage of body fat, women will have a higher BAC than men after consuming the same amount of alcohol. Hormonal fluctuations may also affect the rate of alcohol metabolism, making a woman more susceptible to high BACs at certain times during her menstrual cycle, usually just prior to the onset of menstruation.

blood alcohol concentration (BAC) The amount of alcohol in the blood expressed as the percentage of alcohol in a deciliter of blood, used as a measure of intoxication.

TERMS

QUICK STATS

80,000
American deaths
are related to
excessive alcohol
use each year.

—CDC, 2012

BAC also depends on the balance between the rate of alcohol absorption and the rate of alcohol metabolism. A man who weighs 150 pounds and has normal liver function metabolizes about 0.3 ounce of alcohol per hour, the equivalent of about half a 12-ounce bottle of beer or half a 5-ounce glass of wine.

The rate of alcohol metabolism varies among individuals and is largely determined by genetic factors and drinking behavior. Chronic drinking activates enzymes that metabolize alcohol in the liver, so people who drink frequently metabolize alcohol at a more rapid rate than nondrinkers. Although the rate of alcohol absorption can be slowed by factors like food, the metabolic rate *cannot* be influenced by exercise, breathing deeply, eating, drinking coffee, or taking other drugs. The rate of alcohol metabolism is the same whether a person is asleep or awake.

If a person absorbs slightly less alcohol each hour than he or she can metabolize in an hour, the BAC remains low. People can drink large amounts of alcohol this way over a long period of time without becoming noticeably intoxicated. Regardless, they run the risk of long-term health problems (described later in the chapter). If a person drinks alcohol more quickly than it can be metabolized, the BAC will steadily increase, and he or she will become more and more drunk. (See page T1-2 of the color transparency insert “Touring Lifestyle Behaviors” in this chapter.) Think of a quantity of alcohol drunk over a period of two or three hours—enough to cause intoxication and a hangover the next

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever had a hangover or watched someone else suffer through one? Did the experience affect your attitude about drinking? In what way?

day. Now imagine chugging that same amount in an hour or less. Drinking so much alcohol so quickly could be lethal.

ALCOHOL AND HEALTH

The effects of alcohol consumption on health depend on the individual, the circumstances, and the amount of alcohol consumed.

The Immediate Effects of Alcohol

Blood alcohol concentration is a primary factor determining the effects of alcohol. At low concentrations, alcohol tends to make people feel relaxed and jovial, but at higher concentrations people are more likely to feel angry, sedated, or sleepy. Alcohol depresses the central nervous system (CNS), and its effects vary with the BAC. The effects of alcohol are more pronounced when the BAC is rapidly increasing than when it is slowly increasing, steady, or decreasing. The effects of alcohol are more pronounced if a person drinks on an empty stomach because alcohol is absorbed more quickly and the BAC rises more quickly.

**At a BAC of 0.35%,
coma usually
occurs; any higher
BAC can be fatal.**

Low Concentrations of Alcohol The effects of alcohol can first be felt at a BAC of about 0.03–0.05%. These effects may include lightheadedness, relaxation, and a release of inhibitions. Most drinkers experience mild euphoria and become more sociable. When people drink in social settings, alcohol often seems to act as a stimulant, enhancing conviviality or assertiveness. This apparent stimulation occurs because alcohol depresses inhibitory centers in the brain.

Higher Concentrations of Alcohol At higher concentrations, the pleasant effects tend to be replaced by more negative ones: interference with motor coordination, verbal performance, and intellectual functions. The drinker often becomes irritable and may be easily angered or given to crying. When the BAC reaches 0.1%, most sensory and motor functioning is reduced, and many people become sleepy. Vision, smell, taste, and hearing become less acute. At 0.2% most drinkers are completely unable to function, either physically or psychologically, because of the pronounced depression of the central nervous system, muscles, and other body systems. Coma usually occurs at a BAC of 0.35%, and any higher level can be fatal.

Small doses of alcohol may improve sexual functioning for individuals who are especially anxious or self-conscious, but higher doses often have negative effects, such as reduced erectile response. Effects of chronic heavy drinking include reduction of testosterone levels and impairment of sperm production.

Alcohol causes blood vessels near the skin to dilate, so drinkers often feel warm; their skin flushes, and they may sweat more. Flushing and sweating contribute to heat loss,

however, so the internal body temperature falls. High doses of alcohol may impair the body's ability to regulate temperature, causing it to drop sharply, especially if the surrounding temperature is low. Drinking alcoholic beverages to keep warm in cold weather does not work and can even be dangerous.

Since alcohol is a sedative, it induces sleepiness. But its utility is short-lived because people quickly build up a tolerance to it. Moreover, large amounts of alcohol disturb normal sleep patterns. The sleep that follows drinking becomes poor quality after some hours—fitful and unrefreshing as the person dreams, awakens, and often stays wakeful. Alcohol can also cause or worsen sleep apnea. (Sleep and sleep disorders are discussed in Chapter 2.)

Alcohol Hangover Alcohol's effects wear off slowly, and anyone who has experienced a severe hangover knows they are not fun. The symptoms include headache, shakiness, nausea, diarrhea, fatigue, and impaired mental functioning. But even after sobering up, at high BACs the resulting hangover can continue to leave a person impaired for several hours.

A hangover is probably caused by a combination of the toxic products of alcohol breakdown, dehydration, and hormonal effects. During a hangover, heart rate and blood pressure increase, making some individuals more vulnerable to heart attacks. Electroencephalography (brain wave measurement) shows diffuse slowing of brain waves for up to 16 hours after BAC drops to 0.0%. Studies of pilots, drivers, and skiers all indicate that coordination and cognition are impaired in a person with a hangover, increasing the risk of injury.

The best treatment for hangover is prevention. Nearly all men can expect a hangover if they drink more than five to six standard drinks; for women, the number is three to four drinks. Drinking less, drinking slowly, eating food, and drinking nonalcoholic liquids decrease the risk of hangover. If you ever suffer through a hangover, remember that your driving ability is impaired even after your BAC returns to 0.0%.

Alcohol Poisoning Acute alcohol poisoning occurs much more frequently than most people realize, and all too often it causes death. Drinking large amounts of alcohol in a short time can rapidly raise the BAC into the lethal range. Alcohol, either alone or in combination with other drugs, is responsible for more toxic overdose deaths than any other drug.

Death from alcohol poisoning may be caused either by central nervous system and respiratory depression or by inhaling fluid or vomit into the lungs. The amount of alcohol that renders a person unconscious is dangerously close to a fatal dose. Although passing out may prevent someone from drinking more, BAC can keep rising during unconsciousness because the body continues to absorb ingested alcohol into the bloodstream. Special care should be taken to ensure the safety of anyone who has been drinking heavily, especially if he or she passes out (see the box “Dealing with an Alcohol Emergency”).

TAKE CHARGE

Dealing with an Alcohol Emergency



Remember: Being very drunk is potentially life-threatening. Helping a drunken friend could save a life.

- Be firm but calm. Don't engage the person in an argument or discuss her drinking behavior while she is intoxicated.
- Get the person out of harm's way. Don't let her drive, wander outside, or drink any more alcohol. Reduce stimuli and create a safe, quiet place.
- If possible without distressing the person, eventually try to find out what and how much she drank, and when; and what other drugs or medications she took, how much, and when.
- If the person is unconscious, don't assume she is just "sleeping it off." Place her on her side with her knees up. This position helps prevent choking if she vomits.
- Monitor airway, breathing, and circulation (check pulse).
- Stay with the person. You need to be ready to help if she vomits or stops breathing.
- Don't try to give the person anything to eat or drink, including coffee or other drugs. Don't give cold showers or try to

make her walk around. None of these things help anyone to sober up, and they can be dangerous.

Call 911 immediately in any of the following instances:

- You can't wake the person even with shouting or shaking.
- The person is taking fewer than eight breaths per minute, or her breathing seems shallow or irregular.
- You think the person took other drugs with alcohol.
- The person has had an injury, especially a blow to the head.
- The person drank a large amount of alcohol in a short period of time and then became unconscious. Death caused by alcohol poisoning most often occurs when the blood alcohol level rises very quickly due to rapid ingestion of alcohol.

If you aren't sure what to do, call 911. You may save a life.

Using Alcohol with Other Drugs Alcohol–drug combinations are a leading cause of drug-related deaths. Using alcohol while taking a medication that causes CNS depression increases the effects of both drugs, potentially leading to coma, respiratory depression, and death. Such drugs include barbiturates, Valium-like drugs, narcotics such as codeine, and OTC antihistamines such as Benadryl. For people who consume three or more drinks per day, use of OTC pain relievers like aspirin, ibuprofen, or acetaminophen increases the risk of stomach bleeding or liver damage. Some antibiotics and diabetes medications can also interact dangerously with alcohol.

Many illegal drugs are especially dangerous when combined with alcohol. Life-threatening overdoses occur at much lower doses when heroin and other narcotics are combined with alcohol. When cocaine and alcohol are used together, they form a toxic substance called cocaethylene, which is responsible for more than half of all cocaine-related deaths.

A recent trend among young drinkers is mixing alcoholic beverages with caffeinated ones, especially highly caffeinated energy drinks. Caffeinated alcoholic beverages (CABs) are available premixed, but many people make their own by mixing a favorite energy drink with some type of alcohol such as vodka. CABs are a growing cause of concern because of their popularity with underaged drinkers and because the combined effects of alcohol and caffeine can be dangerous (see the box "Alcoholic Energy Drinks: The Dangers of Being 'Drunk and Wide Awake'"). Several states have taken

action to limit the availability of CABs or to reduce their potency.

The safest strategy is to avoid combining alcohol with any other drug—prescription, over-the-counter, or illegal. If in doubt, ask your pharmacist or doctor before combining any drug with alcohol. Better, just don't do it.

Alcohol-Related Injuries and Violence The combination of impaired judgment, weakened sensory perception, reduced inhibitions, impaired motor coordination, and increased aggressiveness and hostility that characterizes alcohol intoxication can be dangerous. Through homicide, suicide, automobile crashes, and other traumatic incidents, alcohol use is linked to more than 80,000 American deaths each year. The majority of people who attempt suicide have been drinking. Among successful suicides, alcohol use is common, as well; a recent analysis of 5550 suicide deaths found that one-third involved alcohol. Alcohol use more than triples the risk of fatal injuries during leisure activities such as swimming and boating. More than 50% of fatal falls and serious burns happen to people who have been drinking.

Alcohol and Aggression In 2008 more than 2,720,000 arrests were made for alcohol-related offenses (driving under the influence of alcohol, public drunkenness, and liquor law violations). Alcohol use contributes to over 50% of all murders, assaults, and rapes. It is frequently found in the bloodstream of victims as well as perpetrators. Some people



WELLNESS ON CAMPUS

Alcoholic Energy Drinks: The Dangers of Being “Drunk and Wide Awake”

Over the past decade, the practice of blending alcoholic beverages with highly caffeinated energy drinks has grown increasingly popular, particularly among young adults and underage drinkers. According to the CDC, 31% of 12- to 17-year-olds and 34% of 18- to 24-year-olds regularly drink caffeinated alcoholic beverages (CABs), also known as alcoholic energy drinks (AEDs). The caffeine in a CAB masks the depressant effects of the alcohol, producing a “drunk and wide awake” state of alert intoxication, potentially leading the drinker to consume more alcohol than he or she would otherwise. Caffeine does nothing to speed the metabolism of the alcohol by the liver.

More than 13,000 ER visits related to the highly caffeinated drinks were reported in 2009, according to researchers from the U.S. Substance Abuse and Mental Health Services Administration (SAMHSA). Nearly half the emergencies occurred after the beverages were mixed with alcohol or other drugs, and young adults aged 18 to 25 accounted for more than half of those cases, the researchers found.

Cashing in on the lucrative energy drink market and the CAB trend, alcoholic beverage manufacturers have flooded the market with commercial premixed CABs; and by the end of 2009 at least 30 manufacturers were marketing dozens of varieties with names like Rockstar 21, Sparks, and Torque. CABs makers target a youth market and associate their product with extreme sports and activities like skateboarding and snowboarding, emphasizing the “energy boost” the products can provide.

Commercial CABs are typically malt- or distilled-spirits-based and have higher alcohol content than beer (5–12% alcohol by volume compared to 6–8% for beer). The amount of caffeine and other stimulants in a CAB is usually not reported by the manufacturer. Health officials are concerned that many CABs contain much higher levels of caffeine than are found in soft drinks, which are limited by the FDA to 200 parts per million—the amount that meets the criteria for being “generally regarded as safe (GRAS)” for human consumption. However, SAMHSA researchers found some energy drinks that contained as much as 500 mg of caffeine—four to five times the amount in a cup of coffee.

A growing body of evidence highlights the risks associated with the use of caffeinated alcoholic beverages. For example, studies cited by the CDC have reported the following:

- Being in a “drunk/awake” state can lead to risky behaviors such as drunk driving, unplanned sex or sexual assault, and aggression.
- CAB drinkers are three times as likely as non-CAB drinkers to binge-drink.
- CAB drinkers are about twice as likely as non-CAB drinkers to report being taken advantage of sexually, taking advantage of someone sexually, or riding with a driver who was under the influence of alcohol.
- Emerging evidence indicates that CAB use, especially by adolescents, may lead to an increased risk of alcohol or drug dependence later in life.

These concerns and others led the FDA to launch an investigation into the safety, and even the legality, of commercial CABs. In 2009 the FDA sent letters to nearly 30 CAB manufacturers, asking them to prove that their products met GRAS criteria. Manufacturers that could not provide sufficient evidence of their products’ safety risked having their products removed from the marketplace. The FDA investigation is ongoing.

Prior to this investigation, two manufacturers of CABs voluntarily removed their products from the market and committed to discontinuing production of such beverages permanently. In light of this development, and skepticism among scientists that CABs can be proven safe, the CAB market may start to shrink—if not disappear altogether—in the near future.

SOURCES: Arria, A. M., et al. 2009. *Letter to the FDA Regarding the Use of Caffeine in Alcoholic Beverages* (<http://www.fda.gov/downloads/food/foodingredientspackaging/ucm190372.pdf>); Centers for Disease Control and Prevention. 2010. *Alcohol and Public Health: Caffeinated Alcoholic Beverages* (<http://www.cdc.gov/alcohol/fact-sheets/cab.htm>); U.S. Food and Drug Administration. 2010. *Caffeinated Alcoholic Beverages* (<http://www.fda.gov/food/foodingredientspackaging/ucm190366.htm>); U.S. Substance Abuse and Mental Health Services Administration, *Emergency Department Visits Involving Energy Drinks*, (http://www.nlm.nih.gov/medlineplus/news/fullstory_118979.html).

become violent under alcohol’s influence, and in fact alcohol is an important component of gang life, affirming masculinity and male togetherness, and contributing to gang violence. Doubly risky is the effect of alcohol on people predisposed to aggressive behavior, and highly impulsive. In some cases these people may have an underlying psychiatric condition called *antisocial personality disorder*. Their destructive behavior—repeated criminal acts, deceitfulness, impulsiveness, repeated fights or assaults, and disregard for the safety of others—worsens under alcohol’s influence. They are also more likely to become alcohol-dependent. However, all drinkers under alcohol’s influence are subject to unpredictable and injurious consequences.

Alcohol abuse can wreak havoc on home life. Marital discord and domestic violence often exist in the presence of excess alcohol. Heavy drinking by parents is associated with abuse of their children, typically emotional or psychological abuse. Links between parental drinking and physical or sexual abuse are not found consistently, but when such mistreatment does take place, the damaging effect is often long-lasting and associated with alcohol misuse in the grown child. (See the box “Growing Up with Alcoholism.”)

Alcohol and Sexual Decision Making Alcohol seriously impairs a person’s ability to make wise decisions about

sex. A recent survey of college students revealed that frequent binge drinkers were five times more likely to engage in unplanned sexual activity and five-and-a-half times more likely to have unprotected sex than non-binge drinkers. Heavy drinkers are also more likely to have multiple sex partners and to engage in other forms of high-risk sexual behavior. Rates of sexually transmitted diseases (including HIV) and unwanted pregnancy are higher among people who drink heavily than among people who drink moderately or not at all.

Women who binge-drink are at increased risk of rape and other forms of nonconsensual sex. The laws regarding sexual consent are clear: a person who is very drunk or passed out cannot consent to sex. Having sex with a person who is drunk or unconscious is sexual assault.

Drinking and Driving

Drunk driving remains a serious problem in the United States. In 2009, 10,839 Americans were killed in accidents involving drivers with a BAC of 0.08% or higher—about 32% of all traffic fatalities for the year. The National Highway Transportation Safety Administration (NHTSA) estimates that someone is killed in an alcohol-related crash every 45 minutes. Each year more than 275,000 people are injured in alcohol-related car crashes—an average of one person injured every two minutes. In the 2010 National Survey on Drug Use and Health, 15.1% of Americans aged 18–20 admitted driving under the influence of alcohol at least once.

People who drink are unable to drive safely because their judgment is impaired, their reaction time is slower, and their coordination is reduced. Some driving skills are affected at BACs of 0.02% and lower. At a BAC of 0.05%, visual perception, reaction time, and certain steering tasks are all impaired. Any amount of alcohol impairs your ability to drive safely, and fatigue augments alcohol's effects.

The *dose-response function* (see Chapter 9) is the relationship between the amount of alcohol or drug consumed and the type and intensity of the resulting effect. Higher doses of alcohol are associated with a much greater probability of automobile crashes (Figure 10.3). A person driving with a BAC of 0.14% is over 40 times more likely to be involved in a crash than someone with no alcohol in his or her blood. For those with a BAC above 0.14%, the risk of a fatal crash is estimated to be 380 times higher. The risks for young drivers are even greater than indicated in Figure 10.3, even at very low BACs. Younger drivers have less experience with both driving and alcohol, which results in significant impairment with BACs as low as 0.02%.

In addition to an increased risk of injury and death, driving while intoxicated can have serious legal consequences. Drunk driving is against the law. The legal limit for BAC is 0.08% in all states, the District of Columbia, and Puerto Rico. There are stiff penalties for drunk driving, including fines, loss of license, confiscation of vehicle, and jail time.

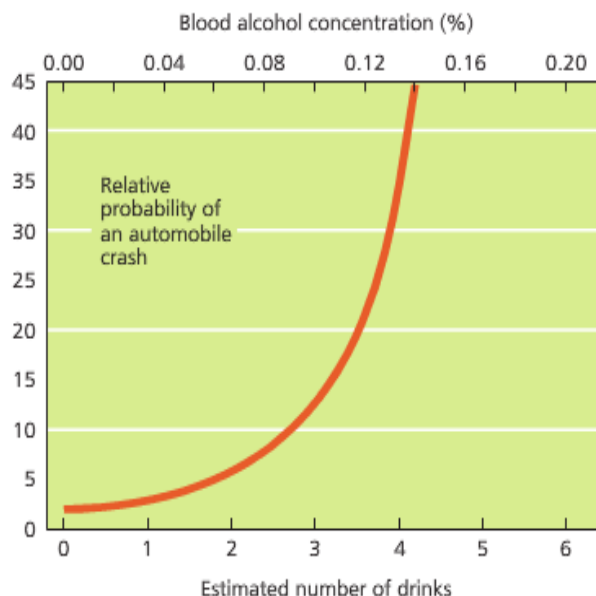


FIGURE 10.3 The dose-response relationship between BAC and automobile crashes.

QUICK STATS

15.1% of American males and 7.9% of females aged 16 and older drove under the influence of alcohol in 2010.

—SAMHSA, 2011

Under current zero-tolerance laws in many states, drivers under age 21 who have consumed *any* alcohol may have their licenses suspended. Increasingly, states are passing laws against having open containers of alcohol in a vehicle and are allowing stricter punishment for repeat offenders.

If you are out of your home and drinking, find alternative transportation or appoint a *designated driver* who doesn't drink and can provide safe transportation home. The responsibility can be rotated for different occasions. Remember, you risk more than your own life when you drink and drive.

Causing serious injury or death results in lifelong feelings of sadness and guilt for the driver and grief for friends and families of victims.

It's more difficult to protect yourself against someone else who drinks and drives. It's reasonable to insist on not being driven by anyone who has been drinking. Learn to be alert to the erratic driving that signals an impaired driver. The following behaviors typically indicate that someone is driving while drunk:

- Wide, abrupt, and illegal turns
- Straddling the center line or lane marker
- Driving against traffic
- Driving on the shoulder
- Weaving, swerving, or nearly striking objects or other vehicles
- Following too closely
- Erratic speed
- Driving with headlights off at night
- Driving with the windows down in very cold weather



EMBRACING WELLNESS

Growing Up with Alcoholism

For a child growing up in a household where alcoholism exists, family life can take a painful toll. Whether the alcoholic is a parent, a sibling, or another relative living with the family, the dysfunctional environment's effects start in childhood and can last throughout adulthood.

Children from households where there is alcoholism—particularly the children of alcoholics (COAs)—deal with constant stress, anxiety, and embarrassment. Many, feeling that the alcohol abuse was somehow their fault, carry a burden of guilt from early childhood on. Nevertheless, most COAs somehow escape the major damage caused by dysfunctional family life: mental illness, alcohol dependence, and alcohol abuse.

In such households, there is often neglect, with household activities revolving around the needs of the alcoholic. The child may witness or be the victim of verbal or physical abuse. The child may simply learn that drinking is an accepted approach to problem solving.

The presence of an alcoholic parent or close relative affects the health and well-being of all members of the household. Other family members are frequently the target of the alcoholic's verbal or physical abuse and all too often have their own problems with alcohol. Nondrinking female spouses of heavy drinkers experience high levels of psychological distress. A recent California study found that both adults and children in the households of alcohol abusers had more medical problems than people from nonabusive households and, not surprisingly, also incurred greater health care costs.

But children are most vulnerable, and an environment of alcoholism results in poor health early on. A very young child is almost completely dependent on the attention and reasonable actions of his caregivers, who may be unable to respond appropriately when the child gets sick. As the child gets older, the caregivers' inability to provide adequate supervision leaves the child vulnerable in other ways.

Yet the outlook for COAs is not as grim as one might expect, given the hurdles these individuals must overcome. Even though their risk of illness, alcohol dependence, and alcohol abuse is greater than for those without family alcoholism, an impressive majority of COAs are not alcohol abusers or alcoholics. In 2001–2002, the National Institute on Alcohol Abuse and Addiction (NIAAA) undertook a comprehensive, in-depth survey on alcohol use, interviewing more than 43,000 Americans aged 18 and older. The accompanying table shows some of the survey's results.

Although adults with a family background of alcoholism were more likely to be current drinkers and to drink more heavily, a sizeable proportion had chosen to never drink, and even more had used alcohol in the past but had abstained for at least a year.

The likelihood of problematic alcohol use is also greater among adults with a family background of alcoholism. In the NIAAA survey, approximately 6% of these adults abused alcohol, and 7.4% were alcohol-dependent. By comparison, 3.4% of respondents without such a family history abused alcohol, and 2.3% were alcohol-dependent. Thus about three times as many people with a family history of alcoholism became alcoholics.

ALCOHOL STATUS

	NO FAMILY HISTORY OF ALCOHOLISM	FAMILY HISTORY OF ALCOHOLISM
Current drinker (1 or more drinks in past 12 months)	61%	71%
Current heavy drinker (men: more than 2 drinks/day; women: more than 1 drink/day)	8%	14%
Former drinker (no drinks in past 12 months)	16%	20%
Lifetime abstainer	23%	9%

NO FAMILY HISTORY OF ALCOHOLISM

FAMILY HISTORY OF ALCOHOLISM

connect
ACTIVITY
DO IT ONLINE

If you see any of these signs in another driver, avoid that vehicle by pulling off the road or turning at the nearest intersection. Report the driver to the police.

The Effects of Chronic Abuse

Because alcohol is distributed throughout most of the body, it can affect many different organs and tissues (Figure 10.4). Problems associated with chronic or habitually excessive use of alcohol include diseases of the digestive and cardiovascular systems and some cancers. Drinking during pregnancy risks the health of both the mother and her developing fetus.

The Digestive System Even in the short term, alcohol can alter the functioning of the liver. Within just a few days of

heavy alcohol consumption, fat begins to accumulate in liver cells, resulting in the development of “fatty liver.” If drinking continues, inflammation of the liver can occur, resulting in alcoholic hepatitis, a frequent cause of hospitalization and death in alcoholics. Both fatty liver and alcoholic hepatitis are potentially reversible if the person stops drinking. With continued alcohol use, however, liver cells are progressively damaged and then destroyed. The destroyed cells are replaced by fibrous scar tissue, a condition known as **cirrhosis**. As cirrhosis develops, a drinker may gradually lose his or her capacity to tolerate

cirrhosis A disease in which the liver is severely damaged by alcohol, other toxins, or infection.

TERMS

IMMEDIATE EFFECTS

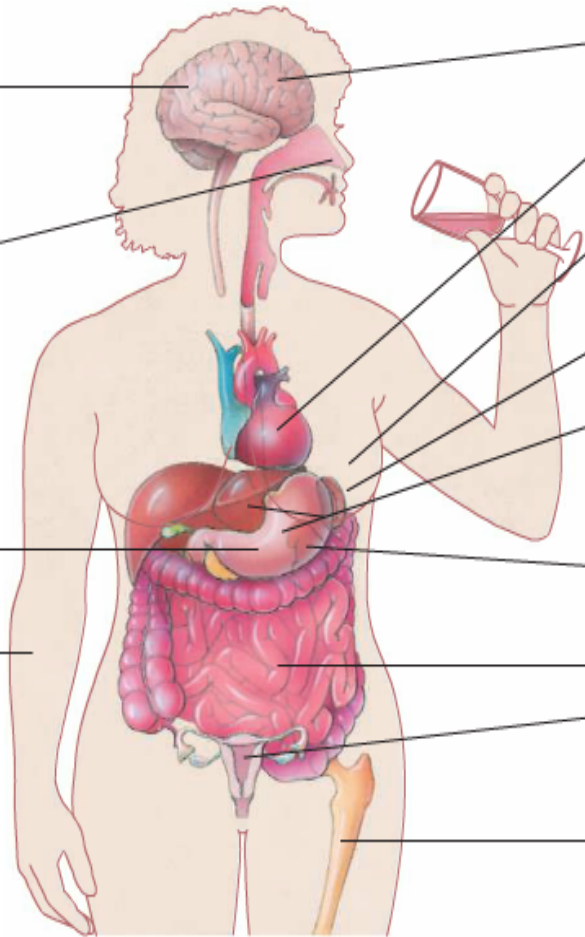
Central nervous system: Impaired reaction time and motor coordination; impaired judgment and sedation; coma and death at high BACs

Senses: Less acute vision, smell, taste, and hearing

Stomach: Nausea, inflammation, and bleeding

Skin: Flushing; sweating; heat loss and hypothermia; formation of broken capillaries

Sexual functioning: In men, reduced erection response



EFFECTS OF CHRONIC USE

Brain: Damaged/destroyed brain cells; impaired memory; loss of sensation in limbs; brain atrophy

Cardiovascular system: Weakened cardiac muscle; elevated blood pressure; irregular heartbeat; increased risk of stroke

Breast: Increased risk of breast cancer

Immune system: Lowered resistance to disease

Digestive system: Cirrhosis of the liver; hepatitis; inflammation of stomach and pancreas; increased risk of cancers of the lip, mouth, larynx, esophagus, liver, rectum, stomach, and pancreas

Kidney: Kidney failure associated with end-stage liver disease

Nutrition: Nutrient deficiencies; obesity

Reproductive system: In women, menstrual irregularities and increased risk of having children with fetal alcohol syndrome (FAS); in men, impotence and impaired sperm production

Bone: Increased risk of osteoporosis; increased risk of fractures from frequent falls

FIGURE 10.4 The immediate and long-term effects of alcohol abuse.

alcohol because fewer and fewer healthy cells remain in the liver to metabolize it.

As with most health hazards, the risk of cirrhosis depends on an individual's susceptibility, which is largely genetically determined, and the amount of alcohol consumed over time. Some people show signs of cirrhosis after a few years of consuming three to four drinks per day. Women generally develop cirrhosis at lower levels of alcohol consumption than men. Heavy drinkers who also inject drugs place themselves at risk of acquiring infection with hepatitis C virus (HCV); the combination of alcohol abuse and HCV increases the risk for cirrhosis and liver cancer.

Signs of cirrhosis can include *jaundice* (a yellowing of the skin and white part of the eyes) and the accumulation of fluid in the abdomen and lower extremities. Some people with cirrhosis show no obvious outward signs of the disease. Treatment for cirrhosis includes correcting nutrient deficiencies and completely abstaining from alcohol. People with cirrhosis who continue to drink have only a 50% chance of surviving five or more years.

Alcohol can inflame the pancreas, causing nausea, vomiting, abnormal digestion, and severe pain. Acute alcoholic pancreatitis generally occurs in binge drinkers. Unlike cirrhosis, which usually occurs after years of fairly heavy alcohol

use, pancreatitis can occur after one or two severe binge-drinking episodes. Acute pancreatitis is often fatal; in survivors it can become a chronic condition.

Overuse of alcohol is a common cause of bleeding in the gastrointestinal tract. Cirrhosis frequently results in the development of enlarged, fragile esophageal and rectal veins, which can easily burst or tear with potentially fatal results. Enlarged esophageal veins are especially vulnerable when the drinker vomits after an alcoholic binge. Even a relatively small amount of alcohol can cause painful irritation of the lining of the stomach.

The Cardiovascular System The effects of alcohol on the cardiovascular system depend on the amount of alcohol consumed. Moderate doses of alcohol—one drink or less a day for women and one to two drinks a day for men—may reduce the risk of heart disease and heart attack in some people. (The possible health benefits of alcohol are discussed later in this chapter.)

However, higher doses of alcohol harm the cardiovascular system. In some people, more than two drinks a day will elevate blood pressure, making stroke and heart attack more likely. Some alcoholics show a weakening of the heart muscle,

a condition known as **cardiac myopathy**. Binge drinking can cause “holiday heart,” a syndrome characterized by serious abnormal heart rhythms, which usually appear within 24 hours of a binge episode.

Cancer In 2000 the U.S. Department of Health and Human Services added alcoholic beverages to its list of known human carcinogens. Chronic alcohol consumption is a clear risk factor for cancers of the mouth, throat, larynx, and esophagus. (These cancers are also associated with use of tobacco, with which alcohol frequently acts as a co-carcinogen.) Five or six daily drinks, especially combined with smoking, increase the risk of these cancers by a factor of 50 or more. Alcohol also is largely responsible for the most common form of liver cancer, and continued heavy drinking in people with hepatitis accelerates progression to this cancer. In all alcohol-related cancers, however, genetics and other biological factors play important roles, and help explain why some chronic alcohol abusers do not get cancer.

Alcohol increases the risk of breast cancer, but quantifying the risk is complicated. A study published in the *Journal of the American Medical Association* in 2011 shows that regularly drinking even a small quantity of alcohol—three to six drinks a week—could significantly increase the risk of breast cancer. The kind of alcohol does not seem to matter. Binge drinking, but not frequency of drinking, was associated with breast cancer risk after controlling for cumulative alcohol intake. Women at otherwise increased risk of breast cancer (for example, those with a family history of breast or ovarian cancer) should carefully weigh the risks of even moderate drinking. Research conducted in 2009 indicates that even moderate drinking may encourage the recurrence of breast cancer in women who have survived the disease before.

Brain Damage Brain damage due to chronic alcohol abuse is also tempered by a person’s physiology and genetics. Imaging studies document that many alcoholics experience brain shrinkage with loss of both gray and white matter, reduced blood flow, and slowed metabolic rates in some brain regions. To some extent, brain shrinkage can be reversed over time with abstinence. About half of the alcoholics in the United States have cognitive impairments, ranging from mild to severe. These include memory loss, dementia, and compromised problem-solving and reasoning abilities. Malnutrition, particularly thiamine deficiency, contributes to severe brain damage.

Mortality Excessive alcohol consumption is a factor in several leading causes of death for Americans. Average life expectancy among alcoholics is about 15 years less than among

nonalcoholics. About half the deaths caused by alcohol are due to chronic conditions such as cirrhosis and cancer; the other half are due to acute conditions or events such as car crashes, falls, and suicide. Because many deaths from acute conditions occur in youths and young adults, alcohol is responsible for 2.3 million years of potential life lost each year.

Alcohol Use during Pregnancy

During pregnancy, alcohol and its metabolic product acetaldehyde readily cross the placenta, harming the developing fetus. Damage to the fetus depends on the amount of alcohol consumed and the stage of the pregnancy. Early in pregnancy, heavy drinking can cause spontaneous abortion or miscarriage. Alcohol in early pregnancy, during critical fetal development periods, can also cause a collection of birth defects known as *fetal alcohol syndrome* (FAS), which was discussed in Chapter 8.

Because rapid brain development continues throughout pregnancy, the fetal brain stays vulnerable to alcohol use until birth. Although effects of drinking later in pregnancy do not typically cause the characteristic physical deformities of FAS, getting drunk just once during the final three months of pregnancy can damage a fetal brain.

FAS is a permanent, incurable condition that causes lifelong disability; it is among the most common preventable causes of mental retardation in the Western world. Full-blown FAS occurs in up to 15 out of every 10,000 live births in the United States. About three times as many babies are born with **alcohol-related neurodevelopmental disorder** (ARND). Children with ARND appear physically normal but often have significant learning and behavioral disorders. As adults, they are more likely to develop substance abuse problems and to have criminal records. The whole range of FAS and ARND is commonly called *fetal alcohol spectrum disorder* (FASD).

No one is sure exactly how much alcohol causes FASD or ARND. Like other untoward effects of alcohol, genetics and individual differences in metabolism, along with environmental factors such as diet, are thought to affect vulnerability. A 2002 study found that children born to mothers who

The U.S. Department of Health and Human Services has listed alcohol as a known human carcinogen.

QUICK STATS

12.2% (about one in eight) of pregnant women drink alcohol, and almost 2% (about 1 in 50) are binge drinkers.

—CDC, 2012

cardiac myopathy Weakening of the heart muscle through disease.

alcohol-related neurodevelopmental disorder (ARND) Cognitive and behavioral problems seen in people whose mothers drank alcohol during pregnancy.

TERMS



Experts warn that there is no safe level of alcohol consumption during pregnancy.

drank as little as one and a half alcoholic drinks per week during their pregnancy weighed less and were shorter at age 14 than children of mothers who drank nothing during pregnancy. This was one of the first studies to show a significant difference between the children of nondrinkers and those of light drinkers. The children's smaller size may be a marker for subtle, persistent alcohol damage. Therefore, no amount of alcohol during pregnancy is considered safe.

Women who are trying to conceive, or who are sexually active without using effective contraception, should abstain from alcohol to avoid inadvertently harming their fetus in the

first few days or weeks of pregnancy, before they know they're expecting. Binge drinking among women of childbearing age is a particular concern.

Any alcohol consumed by a nursing mother quickly enters the breast milk. What impact this has on the child or on the mother's milk production is a matter of controversy. Dosage may again be the key issue. Many physicians advise nursing mothers to abstain from drinking alcohol because of the possibility that any amount may have negative effects on the baby's brain development.

Possible Health Benefits of Alcohol

Numerous studies have shown that, on average, light to moderate drinkers (no more than one drink per day for women, and two drinks per day for men) live longer than either abstainers or heavy drinkers.

The risks and benefits of drinking alcohol vary considerably with the age of the drinker. If you are 35 or younger, your odds of dying *increase* in direct proportion to the amount of alcohol you drink. Among people under age 35, even light drinkers have slightly higher mortality rates than nondrinkers. In other words, young adults who drink *any* amount of alcohol are more likely to die than nondrinkers of the same age. By contrast, alcohol consumption appears to confer health benefits primarily to older individuals.

The clearest evidence of benefit relates to coronary heart disease (CHD). The lowest rates of CHD deaths occur with moderate alcohol use, which in studies had a positive effect on both healthy people and individuals at risk for CHD. (CHD is discussed in detail in Chapter 15.) In a 2006 study of men age 50 and over, those who drank moderately each day reduced their risk of CHD by about 40% compared to men who never drank. The difference was not as great in women. Moderate drinking may improve heart health by raising blood levels of HDL (the beneficial form of cholesterol), by thinning the blood, and by reducing inflammation and the risk of dangerous blood clots, all of which can contribute to the risk of a heart attack. People with heart disease or with strong risk factors should talk with their doctors about the possible health benefits of moderate drinking.

Some evidence also suggests that moderate drinkers may be less likely to develop or better able to manage a variety of other conditions, including diabetes, high blood pressure, strokes, arterial blockages in the legs, cognitive decline (including Alzheimer's disease), and benign prostate enlargement. It is still unclear if these effects are due to the alcohol itself or to the nonalcoholic components of alcoholic drinks (the substances that give each different kind of beverage its distinctive character).

Research is under way to determine whether the apparent health benefits of wine are due to the alcohol or to some other substance found in wine. Some experts believe that the apparent benefit of wine may merely reflect the fact that wine drinkers tend to be more affluent and to have healthier lifestyles than non-wine drinkers.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever witnessed or been involved in an alcohol emergency? Did you think the situation was urgent at the time? What were the circumstances surrounding the event? How did the people involved deal with it?

ALCOHOL ABUSE AND DEPENDENCE

Abuse of and dependence on alcohol affect more than just the drinker. Friends, family members, coworkers, strangers that drinkers encounter on the road, and society as a whole pay the physical, emotional, and financial costs of the misuse of alcohol.

Statistics on Alcohol Use

The CDC estimates that about 60% of Americans age 18 and older drink alcohol routinely or infrequently. Approximately 15% of Americans are former drinkers, and 25% are lifetime abstainers.

According to the National Survey on Drug Abuse and Health for 2010, almost 7% of Americans were classified as heavy alcohol users. Excessive alcohol use is responsible for 80,000 deaths per year among Americans and is the third leading lifestyle-related cause of death.

Abuse versus Dependence

Alcohol abuse is recurrent alcohol use that has negative consequences, such as drinking in dangerous situations (before driving, for instance) or drinking patterns that result in academic, professional, interpersonal, or legal difficulties. One does not have to be an alcoholic to have problems with alcohol. The person who drinks only once a month, but then drives while intoxicated, is an alcohol abuser. One in four full-time college students have experienced alcohol abuse or dependence in the past year. Nearly half of college student treatment admissions are for primary alcohol abuse.

Alcohol dependence, or **alcoholism**, involves more extensive problems with alcohol use, usually involving physical tolerance and withdrawal. Alcoholism is discussed in greater detail later in the chapter.

How can you tell if you or someone you know is becoming alcohol-dependent? Look for the following warning signs:

- Drinking alone or secretly
- Using alcohol deliberately and repeatedly to perform or get through difficult situations
- Using alcohol as a way to “self-medicate” in order to dull strong emotions or negative feelings
- Feeling uncomfortable on certain occasions when alcohol is not available
- Escalating alcohol consumption beyond an already established drinking pattern
- Consuming alcohol heavily in risky situations, such as before driving
- Getting drunk regularly or more frequently than in the past
- Drinking in the morning or at other unusual times

Binge Drinking

New estimates (2012) show that binge drinking is a bigger problem than we previously thought. More than 38 million U.S. adults binge-drink—that’s one in six people over 18 years old—about four times a month. And this is most common among 18- to 34-year-old men. **Binge drinking** is a pattern of rapid, periodic drinking that brings a person’s blood alcohol concentration up to 0.08% or higher, typically with five or fewer drinks for men, or four drinks for women, typically within about two hours. This definition is used by the National Institute on Alcohol Abuse and Alcoholism, part of NIH and the Centers for Disease Control. Surprisingly, most binge drinkers are not alcohol-dependent. If their judgment were not impaired, they might be freer to decide not to binge.

Among Americans under 21 years old, most drinking occurs in the form of bingeing, and over 90% of the alcohol they drink is consumed while binge drinking. Over half the alcohol consumed by all adults in the United States is downed during binge drinking.

The price of binge drinking is huge, and everyone has to pay. Binge drinking caused more than half the 80,000 deaths and three-fourths of the estimated economic cost of excessive drinking, \$223.5 billion, in 2006. The economic cost of excessive drinking was \$223.5 billion in 2006. Drinking too much, including binge drinking, cost \$746 per person, or \$1.90 per drink, in the United States in 2006 (the latest available data).

Binge drinking profoundly affects students’ lives (see the box “College Binge Drinking”). Frequent binge drinkers are three to seven times more likely than non-binge drinkers to engage in unplanned or unprotected sex, to drive after drinking, and to get hurt or injured (Table 10.2). Binge drinkers are also more likely to miss classes, fall behind in schoolwork, and argue with friends. The more frequent the binges, the more problems these students encounter. Despite their experiences, fewer than 1% of the binge drinkers identified themselves as problem drinkers.

Alcoholism

As mentioned earlier, alcoholism (alcohol dependence) is usually characterized by tolerance to alcohol and withdrawal symptoms. Everyone who drinks—even nonalcoholics—develops tolerance after repeated alcohol use.

alcohol abuse The use of alcohol to a degree that causes physical damage, impairs functioning, or results in behavior harmful to others.

TERMS

alcohol dependence or alcoholism A pathological use of alcohol or impairment in functioning due to alcohol; characterized by tolerance and withdrawal symptoms.

binge drinking Periodically drinking alcohol to the point of severe intoxication: about four drinks (for women) and five drinks (for men) consumed within a period of about two hours.

VITAL STATISTICS

Table 10.2

The Effects of Binge Drinking on College Students

ALCOHOL-RELATED PROBLEM	PERCENTAGE OF STUDENTS EXPERIENCING PROBLEMS	
	NON-BINGE DRINKERS	FREQUENT BINGE DRINKERS
Drove after drinking alcohol	18	58
Did something they regretted	17	62
Argued with friends	10	43
Engaged in unplanned sex	9	41
Missed a class	9	60
Got behind in schoolwork	9	42
Had unprotected sex	4	21
Got hurt or injured	4	28
Got into trouble with police	2	14
Had five or more of these problems since school year began	4	48

SOURCE: Wechsler, H., and B. Wuethrich. 2003. *Dying to Drink: Confronting Binge Drinking on College Campuses*, reprint ed. Emmaus, PA: Rodale.

Patterns and Prevalence Alcoholism occurs among people of all ethnic groups and at all socioeconomic levels. The stereotype of the homeless, impoverished alcoholic actually accounts for fewer than 5% of all alcohol-dependent people and usually represents the final stage of a drinking career that began years earlier. There are different patterns of alcohol dependence, including these four common ones:

- Regular daily intake of large amounts.
- Regular heavy drinking limited to weekends.
- Long periods of sobriety interspersed with binges of daily heavy drinking lasting for weeks or months.
- Heavy drinking limited to periods of stress.

Once established, alcoholism often exhibits a pattern of exacerbations and remissions. The person may stop drinking and abstain from alcohol for days or months after a frightening problem develops. After a period of abstinence, an alcoholic often attempts controlled drinking, which almost inevitably leads to an escalation in drinking and more problems. Alcoholism is not hopeless, however; many alcoholics achieve permanent abstinence.

Health Effects Tolerance and withdrawal can have a serious impact on health. As described in Chapter 9, *tolerance* means that a drinker needs more alcohol to achieve intoxication or the desired effect, that the effects of continued use of the same amount of alcohol are diminished, or that the drinker can function adequately at doses or a BAC that

would produce significant impairment in a casual user. Heavy users of alcohol may need to consume about 50% more than they originally needed in order to experience the same degree of intoxication.

When alcoholics stop drinking or sharply decrease their intake, they experience *withdrawal*. Symptoms include trembling hands (shakes or jitters), a rapid pulse and accelerated breathing rate, insomnia, nightmares, anxiety, and gastrointestinal upset. These symptoms usually begin 5–10 hours after alcohol intake is decreased and improve after four or five days. After a week most people feel much better; but occasionally anxiety, insomnia, and other symptoms persist for six months or more.

More severe withdrawal symptoms occur in about 5% of alcoholics. These include seizures (sometimes called “rum fits”), confusion, and **hallucinations**. Still less common is **delirium tremens (the DTs)**, a medical emergency characterized by severe disorientation, confusion, epileptic-like seizures, and vivid hallucinations, often of vermin and small animals. The mortality rate from DTs can be as high as 15%, especially in very debilitated people with preexisting medical illnesses.

Alcoholics face all the physical health risks associated with intoxication and chronic drinking described earlier in the chapter. Some damage is compounded by nutritional deficiencies that often accompany alcoholism. A mental problem associated with alcohol use is profound memory gaps (commonly known as blackouts), which are sometimes filled by conscious or unconscious lying.

The specific health effects of alcoholism tend to vary from person to person. For example, one individual may suffer from problems with memory and CNS defects and have no liver or gastrointestinal problems. Another person with a similar drinking and nutritional history may have advanced liver disease but no memory gaps.

Social and Psychological Effects Alcohol use causes more serious social and psychological problems than all other forms of drug abuse combined. For every person who is an alcoholic, another three or four people are directly affected. In a 2004 Gallup poll, about a third of Americans reported that alcohol had been a source of trouble in their families.

Alcoholics frequently suffer from mental disorders in addition to their substance dependence. Alcoholics are much more likely than nonalcoholics to suffer from clinical depression, panic disorder, schizophrenia,

QUICK

STATS

Nearly 17 million Americans are heavy drinkers.

—SAMHSA, 2011

TERMS

hallucination A false perception that does not correspond to external reality, such as seeing visions or hearing voices that are not there.

delirium tremens (the DTs) A state of confusion brought on by the reduction of alcohol intake in an alcohol-dependent person; other symptoms are sweating, trembling, anxiety, hallucinations, and seizures.



WELLNESS ON CAMPUS

College Binge Drinking

Although college binge drinking has been a serious problem for decades, it has recently come under a harsh spotlight due largely to highly publicized alcohol-related tragedies on campus. Deaths from alcohol overdose, alcohol-related injuries (including motor vehicle crashes), violent crimes, student riots, and serious vandalism have all drawn attention to the epidemic of heavy drinking on college campuses.

Drinking on campus is pervasive. Approximately 61% of college students report having drunk alcohol at least once in the past month. According to the 2008 National Survey on Drug Use and Health, nearly 41% of college students reported binge drinking at least once in the past month, and 16% reported being heavy drinkers.

Every year, more than 1800 college students aged 18–24 die from alcohol-related injuries. Another 600,000 sustain unintentional alcohol-related injuries, 700,000 are assaulted by other students who have been drinking, and 100,000 are victims of alcohol-related date rape or sexual assault.

These statistics have shocked many students, administrators, and parents into demanding changes in college attitudes and policies regarding alcohol. In response, the Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism was formed. Its report documents the extent of the alcohol problem and is a call to action for colleges and their surrounding communities to reexamine their alcohol policies and overhaul the campus drinking culture. These efforts, according to the Task Force, must focus on three levels:

1. Ultimately *each student* is accountable and must take responsibility for his or her own behavior. Needed are programs that encourage and support development of healthy attitudes toward alcohol. These programs should target students at increased risk of developing alcohol problems: first-year students, Greek organization members, and athletes. Treatment should be readily available for problem drinkers.
2. The *student body as a whole* must work to discourage



alcohol abuse. These efforts include promoting alcohol-free activities, reducing availability of alcohol, and avoiding social and commercial promotion of alcohol on campus. There should be an environment of acceptance of students who choose to abstain, and disapproval of students who drink to excess. Fraternities, sororities, eating clubs, and other campus organizations should be held accountable for inappropriate alcohol use, especially involving underage students, that takes place on their premises.

3. *Colleges and surrounding communities* must cooperate to discourage excessive drinking. College administrators, law enforcement, bar and liquor store owners, residents who live near campus, and the court system must all do their part to reduce the availability of cheap alcohol and to enforce existing laws. Those who enable students to drink irresponsibly must be held accountable.

In 2007 the U.S. Surgeon General's Call to Action to Prevent and Reduce Underage Drinking suggested (1) eliminating alcohol sponsorship of athletic events and other social activities; (2) implementing responsible alcohol policies; and (3) possibly restricting sale of alcohol at campus facilities such as sports stadiums, campus pubs, and concert halls.

Some schools have attempted to shift classes to Fridays and even Saturdays after it was found that binge drinking increases when students don't have Friday classes. Increasingly, incoming students are required to take a three-hour online class about alcohol. And there is stricter punishment for underage drinking and public drunkenness on some campuses, with the likelihood of suspension for repeat offenders.

Many colleges ban ads for alcoholic drinks in college newspapers and during broadcasts of college athletic events. Flyers, posters, and other promotions for cheap drinks, such as two-for-one specials, happy hours, all you can drink, and ladies' night, are banned on many campuses. In these college communities, bars and restaurants that cater to students are discouraged from offering cheap alcohol incentives.

borderline personality disorder, and antisocial personality disorders. People with anxiety or panic attacks may try to use alcohol to lessen their anxiety, even though alcohol often makes these disorders worse. Alcoholics also often have other substance abuse problems.

Causes of Alcoholism The precise causes of alcoholism are unknown, but many factors are probably involved. Studies of twins and adopted children clearly demonstrate the importance of genetics. If one of a pair of fraternal twins is alcoholic, the other has about twice the normal

risk of becoming alcoholic. For the identical twin of an alcoholic, the risk of alcoholism is about four times that of the general population. These risks persist even when the twins have little contact with each other or their biological parents. Similarly, adoption studies show an increased risk among children of alcoholics, even if they were adopted at birth into nondrinking families. Alcoholism in adoptive parents, contrarily, doesn't make their adopted children more or less likely to become alcoholic. Some studies suggest that as much as 50–60% of a person's risk for alcoholism is determined by genetic factors.

Not all children of alcoholics become alcoholic, however, and it is clear that other factors are involved. A person's risk of developing alcoholism may be increased by certain personality disorders, having grown up in a violent or otherwise troubled household, and imitating the alcohol abuse of peers and other role models. People who begin drinking excessively in their teens are especially prone to binge drinking and alcoholism later in life. Common psychological features of individuals who abuse alcohol are denial ("I don't have a problem") and rationalization ("I drink because I need to socialize with my customers"). Certain social factors have also been linked with alcoholism, including urbanization, disappearance of the extended family, a general loosening of kinship ties, increased mobility, and changing values.

Treatment Some alcoholics recover without professional help. How often this occurs is unknown, but possibly as many as one-third stop drinking on their own or reduce their drinking enough to eliminate problems. Often these spontaneous recoveries are linked to an alcohol-related crisis, such as a blackout or alcohol-related automobile crash, a health problem (especially one that can be made worse by alcohol use), or the threat of losing one's job. Not all alcoholics must hit bottom before they are motivated to stop. People vary markedly in what induces them to change their behavior.

Most alcoholics, however, require a treatment program of some kind in order to stop drinking. Many different kinds of programs exist. No single treatment works for everyone, so a person may have to try different programs before finding the right one.

Although treatment is not successful for all alcoholics, considerable optimism has replaced the older view that nothing could be done. Many alcoholics have patterns of drinking that fluctuate widely over time. These fluctuations indicate that their alcohol abuse is a response to environmental factors, such as life stressors or social pressures, and therefore may be influenced by treatment.

One of the oldest and best-known recovery programs is Alcoholics Anonymous (AA). AA consists of self-help groups that meet several times each week in many communities and follow a 12-step program. Important steps for people in these programs include recognizing that they are "power-

less over alcohol" and must seek help from a "higher power" to regain control of their lives. By verbalizing these steps, the alcoholic directly addresses the denial that is often prominent in alcoholism and other addictions. Many AA members have a sponsor of their choosing who is available by phone 24 hours a day for individual support and crisis intervention. AA convincingly shows the alcoholic that abstinence can be achieved and also provides a sober peer group of people who share the same identity—that of recovering alcoholics. Many AA members find that this method works best in combination with counseling and medical care.

Other recovery approaches are available. Some, like Rational Recovery and Women for Sobriety, deliberately avoid any emphasis on higher spiritual powers. A more controversial approach to problem drinking is offered by the group Moderation Management, which encourages people to manage their drinking behavior by limiting intake or abstaining.

Al-Anon is a companion program to AA for families and friends of alcoholics. In Al-Anon, spouses and others explore how they enable the alcoholic to drink by denying, rationalizing, or covering up his or her drinking and how they can change this codependent behavior.

Employee assistance programs and school-based programs represent another approach to alcoholism treatment. These programs can deal directly with work and campus issues, which are often important sources of stress for the alcohol abuser. They encourage effective coping responses for internal and external stressors.

Inpatient hospital rehabilitation is useful for some alcoholics, especially if they have serious medical or mental problems or if life stressors threaten to overwhelm them. When the person returns to the community, however, it is critical that there be some form of active, continuing, long-term treatment. Patients who return to a spouse or family often need to address issues involving those significant others, and to establish new routines and shared recreational activities that do not involve drinking.

There are also several medical treatments for alcoholism. All of these work best in combination with counseling or other nonpharmacological programs:

- *Disulfiram* (Antabuse) inhibits the metabolic breakdown of acetaldehyde and causes patients to flush and feel ill when they drink, thus theoretically inhibiting impulse drinking. However, disulfiram is potentially dangerous if the user continues to drink.
- *Naltrexone* (ReVia, Depade) binds to a brain pleasure center that reduces the craving for alcohol and decreases its pleasant, reinforcing effects. When taken correctly, naltrexone usually does not make the user feel ill.
- *Injectable naltrexone* (Vivtrol) acts the same as oral naltrexone, but it is a single monthly shot administered by a health professional. Compliance with a monthly regimen may be better for some alcoholics.

Alcohol treatment programs achieve extended sobriety for about 50% of alcoholics who participate.

- *Acamprosate* (Campral) helps people maintain abstinence after they have stopped drinking. It is unclear how acamprosate works, but it appears to act on brain pathways related to alcohol abuse.

A variety of other drugs to treat alcoholism are undergoing clinical trials—alone, in combination, or in combination with counseling therapies.

In people who abuse alcohol and have significant depression or anxiety, the use of antidepressant or antianxiety medication can improve both mental health and drinking behavior. In addition, drugs such as diazepam (Valium) are sometimes prescribed to replace alcohol during initial stages of withdrawal. Such chemical substitutes are usually useful for only a week or so because alcoholics are at particularly high risk for developing dependence on other drugs.

Alcohol treatment programs are successful in achieving an extended period of sobriety for about half of those who participate. Success rates of conventional treatment programs are about the same for men and women and for people from different ethnic groups. Women, minorities, and the poor often face major economic and social barriers to receiving treatment. Most inpatient treatment programs are financially out of reach for people with low income or those without insurance coverage. AA remains the mainstay of treatment for most people and is often a component of even the most expensive treatment programs. Special AA groups exist in many communities for young people, women, gay men and lesbians, non-English speakers, and a variety of interest groups.

Gender and Ethnic Differences

Alcohol abusers come from all socioeconomic levels and cultural groups, but notable differences appear in drinking patterns between men and women and among different ethnic groups (Table 10.3).

Men Men are more likely than women to drink alcohol, to abuse alcohol, and to become dependent on alcohol. Among white American men, excessive drinking often begins in the teens or 20s and progresses gradually through the 30s until the man is clearly identifiable as an alcoholic by the time he is in his late 30s or early 40s. Other men may remain controlled drinkers until later in life, sometimes becoming alcoholic in association with retirement, the loss of friends and loved ones, boredom, illness, or psychological disorders.

Men account for the majority of alcohol-related deaths and injuries in the United States, the greatest proportion occurring in men age 35 and younger. Most alcohol-related deaths and injuries among men result from motor vehicle crashes, falls, drowning, suicide, and homicide.

Various factors contribute to men's higher rates of alcohol use and abuse. Traditional or stereotypical gender roles and ideas regarding masculinity and drinking behavior may promote excessive alcohol consumption among men. Young men in particular are also more likely to engage in all types of risky health behaviors. Men drive more miles, drive more

VITAL STATISTICS

Table 10.3

Users and Abusers of Alcohol in the United States by Demographic Characteristics: 2010

	PAST YEAR PREVALENCE (PERCENTAGE)	
	ALCOHOL USE	ALCOHOL ABUSE OR DEPENDENCE
Gender		
Male	69.4	9.5
Female	63.5	4.7
Ethnicity		
White	70.8	7.4
Black or African American	57.8	5.7
American Indian and Alaska Native	51.2	14.0
Native Hawaiian/Pacific Islander	N/A	5.0
Asian American	55.6	3.2
Hispanic or Latino	58.8	7.6
Two or more races	62.8	7.4
Total population	66.4	7.0

N/A = Not available.

SOURCE: Substance Abuse and Mental Health Services Administration. 2011. *Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration, NSDUH Series H-41, HHS Publication No. (SMA) 11-4658.

dangerously, and are more likely to drive while intoxicated. They tend to have greater access to firearms, contributing to their increased rates of suicide and homicide. Men may also be more likely than women to use alcohol to cope with stress and other life challenges.

Women Because of differences in body structure and chemistry, women become intoxicated at lower doses of alcohol than men, and they tend to experience adverse physical effects of chronic drinking sooner and at lower levels of alcohol consumption. Their progression of drinking alcohol usually differs from men's: women tend to become alcoholic at later ages and with fewer years of heavy drinking. It is not unusual for women in their 40s or 50s to succumb to alcoholism after years of controlled drinking.

Rates of alcohol abuse and dependence among women have increased in the past decade. Women alcoholics develop cirrhosis and other medical complications more often and after a shorter period of heavier drinking than men, and have higher death rates—including deaths from cirrhosis—than male alcoholics. Some alcohol-related health problems are unique to women, including increased risk of breast cancer, menstrual disorders, infertility, and birthing children with FAS. Female alcoholics are less likely to seek early treatment for drinking problems, possibly because of the social stigma

attached to problem drinking. In addition, women may have an inherently greater biological risk for drinking alcohol.

Women from all walks of life and all ethnic groups can develop alcohol problems, but those who have never married or are divorced are more likely to drink heavily than married or widowed women. Women who have multiple life roles, such as parent, worker, and spouse, are less vulnerable to alcohol problems than women who have fewer socially connecting roles.

African Americans As a group, African Americans use less alcohol than most other groups (including whites), but they face disproportionately high levels of alcohol-related birth defects, cirrhosis, cancer, hypertension, and other medical problems. In addition, blacks are more likely than members of other ethnic groups to be victims of alcohol-related homicides, criminal assaults, and injuries. African American women are more likely to abstain from alcohol use than white women, but among black women who drink there is a higher percentage of heavy drinkers. Urban black males commonly start drinking excessively and develop serious neurological illnesses at an earlier age than urban white males. They also have a higher rate of alcoholism-related suicide.

AA groups of predominantly African Americans are effective, perhaps because essential elements of AA—sharing common experiences, mutual acceptance of one another as human beings, and trusting a higher power—are already a part of African American culture. Treatments that use the extended family and occupational training are also effective.

Latinos Drinking patterns among Latinos vary significantly, depending on their specific cultural background and how long they and their families have lived in the United States. Drunk driving and cirrhosis are the most common causes of alcohol-related death and injury among Hispanic men. Hispanic women are more likely to abstain from alcohol than white or black women, but those who drink are at special risk for problems. Treating the entire family as a unit is an important part of treatment because family pride, solidarity, and support are important aspects of Latino culture. Some Hispanics may do better if treatment efforts are integrated with the techniques of folk healers and spiritists.

Asian Americans As a group, Asian Americans have lower-than-average rates of alcohol abuse. However, acculturation may somewhat weaken the generally strong Asian

taboos and community sanctions against alcohol misuse. For many Asian Americans, though, the genetically based physiological aversion to alcohol remains a deterrent to abuse. Ethnic agencies, health care professionals, and ministers seem to be the most effective sources of treatment for members of this group, when needed.

American Indians and Alaska Natives Alcohol abuse is one of the most widespread and severe health problems among American Indians and Alaska Natives, especially for adolescents and young adults. Excessive drinking varies from tribe to tribe but is generally high in both men and women. The rate of alcoholism among American Indians is twice that of the general population, and the death rate from alcohol-related causes is about eight times higher. Treatment may be more effective if it reflects tribal values.

Helping Someone with an Alcohol Problem

Helping a friend or relative with an alcohol problem requires skill and tact. Start by making sure you are not enabling someone to continue excessively using alcohol. Enabling takes many forms, such as making excuses for the alcohol abuser—for example, saying “he has the flu” when it is really a hangover.

Another important step is open, honest labeling—“I think you have a problem with alcohol.” Such explicit statements usually elicit emotional rebuttals and may endanger a relationship. However, you are not helping your friends by allowing them to deny their problems with alcohol or other drugs. Taking action shows that you care.

Even when problems are acknowledged, there is usually reluctance to get help. You can’t cure a friend’s drinking problem, but you can guide him or her to appropriate help. Your best role might be to obtain information about the available resources and persistently encourage their use. Consider making an appointment for your friend at the student health center and then go with him or her to the appointment. Most student health centers will be able to recommend local options for self-help groups and formal treatment; the counseling center is another excellent source for help. You can also check the phone book and the Internet for local chapters of AA and other groups (see “For More Information” at the end of the chapter). And don’t underestimate the power of families to help. An honest phone call to your friend’s parents could save a life if your friend is in serious trouble with alcohol.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know anyone with a serious alcohol problem? From what you have read in this chapter, would you say that person abuses alcohol or is dependent on it? What effects, if any, has this person’s problem had on your life? Have you thought about getting support or help?

DRINKING BEHAVIOR AND RESPONSIBILITY

Responsible use of alcohol means keeping your BAC low so that your behavior is always under your control. In addition to controlling your own drinking, you can promote responsible alcohol use in others.

Examine Your Drinking Behavior

When you want to drink responsibly, it's helpful to know, first of all, why you drink. The following are common reasons given by college students:

- "It lets me go along with my friends."
- "It makes me less self-conscious and more social."
- "It makes me less inhibited."
- "It relieves depression, anxiety, tension, or worries."
- "It enables me to experience a different state of consciousness."

If you drink alcohol, what are your reasons for doing so?

After examining your reasons for drinking, take a closer look at your drinking behavior. Is it moderate and responsible? Or do you frequently overindulge and suffer negative consequences? The "Behavior Change Strategy" section at the end of the chapter explains how to keep and analyze a record of your drinking. The CAGE screening test can help you determine whether you, or someone close to you, may have a drinking problem. Answer yes or no to the following questions:

Have you ever felt you should ...

Cut down on your drinking?

Have people ...

Annoyed you by criticizing your drinking?

Have you ever felt bad or ...

Guilty about your drinking?

Have you ever had an ...

Eye-opener (a drink first thing in the morning to steady your nerves or get rid of a hangover)?

One "yes" response suggests a possible alcohol problem; if you answered yes to more than one question, it is highly likely that a problem exists. For a more detailed evaluation of your drinking habits, complete the AUDIT questionnaire in the box "Do You Have a Problem with Alcohol?" If the results of either assessment test indicate a potential problem, get help right away.

Using alcohol responsibly means keeping your BAC low so your behavior is always under control.

Drink Moderately and Responsibly

Sometimes people lose control when they misjudge how much they can drink. At other times, they set out deliberately to get drunk. Following are some strategies for keeping your drinking and your behavior under control:

- **Drink slowly.** Sip your drinks instead of gulping them. Do not drink alcoholic beverages to quench your thirst.

Avoid drinks made with carbonated mixers, especially if you're thirsty; you'll be more likely to gulp them down.

- **Space your drinks.** Drink nonalcoholic drinks at parties, or alternate them with alcoholic drinks. Learn to refuse a round: "I've had enough for right now." Parties are easier for some people if they hold a glass of something nonalcoholic that has ice and a twist of lime floating in it so it looks like an alcoholic drink.

- **Eat before and while drinking.** Avoid drinking on an empty stomach. Food in your stomach will not prevent the alcohol from eventually being absorbed, but it will slow down the rate somewhat and lower the peak BAC. In restaurants, order your food before you order a drink. Try to have

something to eat before you go out to a party where alcohol will be served.



Eating food while you are drinking will slow the rate of alcohol absorption and lower your peak BAC.

ASSESS YOURSELF

Do You Have a Problem with Alcohol?



The Alcohol Use Disorders Test (AUDIT) is a screening tool for problem drinking. It can also be used for self-assessment. For each question, choose the answer that best describes your behavior. Then total your scores.

QUESTIONS	POINTS					YOUR SCORE
	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2–4 times a month	2–3 times a week	0	_____
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7–9	10 or more	_____
3. How often do you have five or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	_____
4. How often during the past year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	_____
5. How often during the past year have you failed to do what was normally expected because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	_____
6. How often during the past year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	_____
7. How often during the past year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	_____
8. How often during the past year have you been unable to remember what happened the night before because you had been drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	_____
9. Have you or someone else been injured as a result of your drinking?	No	Yes, but not in the past year (2 points)		Yes, during the past year (4 points)		_____
10. Has a relative, friend, doctor, or other health worker been concerned about your drinking or suggested you cut down?	No	Yes, but not in the past year (2 points)		Yes, during the past year (4 points)		_____

TOTAL _____

A total score of 8 or more indicates a strong likelihood of hazardous or harmful alcohol consumption. Even if you score below 8, if you are encountering drinking-related problems with your academic performance, job, relationships, health, or the law, you should consider seeking help.

SOURCE: Sanders, J. B., et al. 1993. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction* 88(6), Appendix, p. 803. Copyright © 2006, 1993 Society for the Study of Addiction to Alcohol and Other Drugs. Reprinted by permission of Blackwell Publishers.

- **Know your limits and your drinks.** Learn how different BACs affect you. In a safe setting such as your home, with your roommate or a friend, see how a set amount—say, two drinks in an hour—affects you. A good test is walking heel to toe in a straight line with your eyes closed or standing with your feet crossed and trying to touch your finger to your nose with your eyes closed.

Be aware that in different settings your performance, and especially your ability to judge your behavior, may change. At a given BAC, you will perform less well when surrounded by activity and boisterous companions than you will in a quiet test setting with just one or two other people. This impairment results partially because alcohol reduces your ability to perform when your brain is bombarded by multiple stimuli.



CRITICAL CONSUMER

Alcohol Advertising

To be a careful and informed health consumer, you need to consider the effects that advertisements have on you.

Alcohol manufacturers spend \$6 billion every year on advertising and promotions. They claim that the purpose of their advertising is to persuade adults who already drink to choose a certain brand. But in reality, ads cleverly engage young people and children—never overtly suggesting that young people should drink, but clearly linking alcohol and good times.

Alcohol ads are common during televised sporting events and other shows popular with teenagers. Studies show that the more TV adolescents watch, the more likely they are to take up drinking in their teens. New alcoholic drinks geared to the tastes of young people are heavily promoted. “Hard lemonade” and other fruity or sweetened drinks (“alcopops” or “low-alcohol refreshers”) have been described by teens as a way to get drunk without suffering the bitter taste of most alcoholic beverages. Though only recently introduced, these drinks have been tried by almost half of 14- to 18-year-olds.

connect
ACTIVITY
DO IT ONLINE

Promote Responsible Drinking

Although you cannot completely control the drinking behavior of others, you can promote responsible drinking.

Encourage Responsible Attitudes Our society teaches us attitudes toward drinking that contribute to alcohol-related problems. Many of us have difficulty expressing disapproval about someone who has drunk too much, and we are amused by the antics of a funny drunk. We accept the alcohol industry’s linkage of drinking with virility or sexuality (see the box “Alcohol Advertising”). And many people treat nondrinkers as nonconformists in social settings. Recognize that the choice to abstain is neither odd nor unusual. More than one-third of adults do not drink at all or drink very infrequently. Most adults are capable of enjoying their leisure time without alcohol or drugs.

Be a Responsible Host When you are the host, serve nonalcoholic beverages as well as alcohol. Have only enough alcohol on hand for each guest to have a moderate amount. Don’t put out large kegs of beer because these invite people to overindulge. For parties hosted by a dorm, fraternity, or other campus group, don’t allow guests to have unlimited drinks for a single admission fee because this also encourages binge drinking.

Always serve food along with alcohol, and stop serving alcohol an hour or more before people will leave. If possible, arrange carpools with designated nondrinking drivers in advance. Remind your guests who are under 21 about the zero-tolerance

Alcohol manufacturers also reach out to young people at youth-oriented activities like concerts and sporting events. Product logos are heavily marketed through sales of T-shirts, hats, and other items. Many colleges allow alcohol manufacturers to advertise at campus events in exchange for sponsorship.

What is the message of all these advertisements? Think about the alcohol ads you’ve seen. Many give the impression that drinking alcohol is a normal part of everyday life and good times. This message seems to work well on the young, many of whom believe that heavy drinking at parties is normal and fun. The use of famous musicians, athletes, or actors in commercials increases the appeal of alcohol by associating it with fame, wealth, sex, and popularity. Many beer advertisements, for example, portray beer drinking as a critical part of one’s success in finding an attractive mate.

What ads don’t show is the darker side of drinking. You never see hangovers, car crashes, slipping grades, or violence. Although some ads include a brief message such as “know when to say when,” the impact of such cautions is small compared to that of the image of happy, attractive young people having fun while drinking.

The next time you see an advertisement for alcohol, take a critical look. What is the message of the ad? What audience is being targeted, and what is the ad implying about alcohol use? Be aware of its effect on you.

laws in many states—even a single drink can result in an illegal BAC. Insist that guests who drink too much take a taxi, ride with someone else, or stay overnight rather than drive.

Plan social functions with no alcohol at all. Outdoor parties, hikes, and practically every other type of social occasion can be enjoyable without alcohol. If that doesn’t seem possible to you, then examine your drinking patterns and attitudes toward alcohol. If you can’t have fun without drinking, you may have a problem with alcohol.

Hold the Drinker Responsible Anyone who consumes alcohol must take full responsibility for his or her behavior. Pardoning unacceptable behavior fosters the attitude that the behavior is caused by the drug. The drinker is thereby excused from responsibility and learns to expect minimal adverse consequences for bad behavior. The opposite approach—holding the individual fully accountable—is a more effective policy. For example, alcohol-impaired drivers who receive strict penalties have fewer subsequent rearrests than those who receive only mandatory treatment. Other people’s drunkenness can impinge on your living or study environment. Speak up against this behavior—and insist on your rights.

Take Community Action Consider joining an action group such as Students Against Destructive Decisions (SADD). Through lesson plans, peer counseling, and the promotion of better communication between students and parents, SADD helps students avoid the dangers of drinking, drug use, impaired driving, and other destructive choices.

Connect to Your Choices

Have you ever thought about why you make the alcohol-related decisions you do? Many factors can influence our choices regarding alcohol, some more obvious than others. Are there alcohol-free events on your campus, or do most social occasions seem to require alcohol? Is the ability to drink large amounts of alcohol a status symbol in your peer group? Do you live in a neighborhood where the corner store is a liquor store rather than a grocery store? Is drinking normalized on your campus by sponsorship of athletic events by alcoholic beverage companies?

What are the external factors that influence your choices about alcohol use? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

The responsible use of alcohol means drinking in moderation or not at all.

RIGHT NOW YOU CAN:

- Consider whether there is a history of alcohol abuse or dependence in your family.
- Think about your current drinking habits. For example, count the number of parties you attended in the past month and how many drinks you had at each one.
- Take stock of the number of alcoholic beverages in your home. Does there always seem to be a lot on hand? Do you find yourself purchasing alcohol frequently? What do your purchasing habits say about your drinking?

IN THE FUTURE YOU CAN:

- Think about the next party you plan to attend. Decide how much you will drink at the party, and how you will get home afterward.
- Watch your friends' behavior at events where drinking is involved. Do any of them show signs of a drinking problem? If so, consider what you can do to help.

SUMMARY

- Although alcohol has long been a part of human celebrations, it is a psychoactive drug capable of causing addiction.

- After being absorbed into the bloodstream in the stomach and small intestine, alcohol is transported throughout the body. The liver metabolizes alcohol as blood circulates through it.

- If people drink more alcohol each hour than the body can metabolize, blood alcohol concentration (BAC) increases. The rate of alcohol metabolism depends on a variety of individual factors.

- Alcohol is a CNS depressant. At low doses, it tends to make people feel relaxed.

- At higher doses, alcohol interferes with motor and mental functioning; at very high doses, alcohol poisoning, coma, and death can occur. Effects may be increased if alcohol is combined with other drugs.

- Alcohol use increases the risk of injury and violence; drinking before driving is particularly dangerous, even at low doses.

- Chronic alcohol use has negative effects on the digestive and cardiovascular systems and increases cancer risk and overall mortality.

- Pregnant women who drink risk giving birth to children with a cluster of birth defects known as fetal alcohol syndrome (FAS). Even occasional drinking during pregnancy can cause brain injury in the fetus.

- Moderate drinking may decrease the risk of coronary heart disease in some people.

- Alcohol abuse involves drinking in dangerous situations or drinking to a degree that causes academic, professional, interpersonal, or legal difficulties.

- Alcohol dependence, or alcoholism, is characterized by more extensive problems with alcohol, usually involving tolerance and withdrawal.

- Binge drinking is a common form of alcohol abuse on college campuses that has negative effects on both drinking and nondrinking students.

- Physical consequences of alcoholism include the direct effects of tolerance and withdrawal, as well as all the problems associated with chronic drinking. Psychological problems include memory loss and additional mental disorders such as depression.

- Alcoholism treatment approaches include mutual support groups like AA, job- and school-based programs, inpatient hospital programs, and pharmacological treatments.

- Helping someone who abuses alcohol means avoiding being an enabler, and obtaining information about available resources and persistently encouraging their use.

- Strategies for keeping drinking under control include examining attitudes about drinking and drinking behavior, drinking slowly, spacing drinks, eating before and while drinking, and knowing one's limits.

- Strategies for promoting responsible drinking in others include encouraging responsible attitudes, being a responsible host, holding the drinker responsible for his or her actions, learning about prevention programs, and taking community action.

FOR MORE INFORMATION

BOOKS

Herrick, C. 2007. *100 Questions & Answers about Alcoholism & Drug Addiction*. Boston: Jones and Bartlett. Answers a range of specific questions about alcohol abuse, dependence, and treatment options.

Kinney, J. 2011. *Loosening the Grip: A Handbook of Alcohol Information*, 10th ed. New York: McGraw-Hill. An authoritative source of information on alcohol use and its impact on families and societies.

Lu, K. 2006. *Media and College Binge-Drinking: Direct and Indirect Media Influences on Drinking Norms*. Ann Arbor: ProQuest/UMI. A quantitative review of the effect of the media on students' perceptions about drinking.

Seaman, B. 2006. *Binge: Campus Life in an Age of Disconnection and Excess*. New York: Wiley. An exploration of campus life at 12 residential colleges and universities, with discussions on the effects of student isolation, peer pressure, and drinking on today's students.

ORGANIZATIONS, HOTLINES, AND WEBSITES

Al-Anon Family Group Headquarters. Provides information and referrals to local Al-Anon and Alateen groups. The website includes a self-quiz to determine if you are affected by someone's drinking.

<http://www.al-anon.alateen.org>

Alcoholics Anonymous (AA) World Services. Provides general information about AA, literature about alcoholism, and information about AA meetings and related 12-step organizations.

<http://www.aa.org>

AlcoholScreening.Org. Provides information about alcohol and health, referrals for treatment and support groups, and a drinking self-assessment.

<http://www.alcoholscreening.org>

Alcohol Treatment Referral Hotline. Provides referrals to local intervention and treatment providers.

800-ALCOHOL

Bacchus and Gamma Peer Education Network. An association of college- and university-based peer education programs that focus on prevention of alcohol abuse.

<http://www.bacchusgamma.org>

The College Alcohol Study. Harvard School of Public Health. Provides information about and results from the recent studies of binge drinking on college campuses.

<http://www.hsph.harvard.edu/cas>

Higher Education Center for Alcohol and Other Drug Prevention. Provides support for campus alcohol and illegal drug prevention efforts; a website gives information about alcohol and drug abuse on campus and links to related sites.

<http://www.higheredcenter.org>

Mothers Against Drunk Driving (MADD). Supports efforts to develop solutions to the problems of drunk driving and underage drinking; provides news, information, and brochures about many topics, including a guide for giving a safe party.

<http://www.madd.org>

National Association for Children of Alcoholics (NACoA). Provides information and support for children of alcoholics.

888-554-COAS

<http://www.nacoa.net>

National Council on Alcoholism and Drug Dependence (NCADD). Provides information and counseling referrals.

212-269-7797; 800-NCA-CALL (24-hour Hope Line)

<http://www.ncadd.org>

National Institute on Alcohol Abuse and Alcoholism (NIAAA). Provides booklets and other publications on a variety of alcohol-related topics, including fetal alcohol syndrome, alcoholism treatment, and alcohol use and minorities.

<http://www.niaaa.nih.gov>

Rational Recovery. A free self-help program that offers an alternative to 12-step programs; the emphasis is on learning the skill of abstinence.

<http://www.rational.org>

Substance Abuse and Mental Health Services Administration. Provides statistics and information about alcohol abuse, including resources for people who want to help friends and family members overcome alcohol abuse problems.

<http://store.samhsa.gov/home>

See also the listings for Chapter 9.

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BEHAVIOR CHANGE STRATEGY

Developing Responsible Drinking Habits

How much do you drink? Is it the right amount for you? You may know the answer to this question already, or you may not have given it much thought. Many people learn through a single unpleasant experience how alcohol affects them. Others suffer ill effects but choose to ignore or deny them.

To make responsible and informed choices about using alcohol, start by considering whether there is any history of alcohol abuse in your family. If someone in your family is dependent on alcohol, you have a higher-than-average likelihood of becoming dependent too. Second, consider whether you are dependent on other substances or behaviors. Do you smoke, drink strong coffee every day, or use other drugs regularly? Does some habit control your life? Some people have more of a tendency to become addicted than others, and a person with one addiction is often likely to have other addictions as well. If this is the case for you, again you may need to be more cautious with alcohol.

Keep a Record

Once you have answered these questions, find out more about your alcohol-related behavior by keeping track of your drinking for two weeks in your health journal. Keep a daily alcohol behavior record like the one illustrated in Chapter 1 for eating behavior. Include information about the following:

- *The drinking situation*, including type of drink, time of day, how fast you drank it, where you were, and what else you were doing.
- *Your internal state*, including what made you want to drink and your feelings, thoughts, and concerns at the time. Note how others influenced you.
- *The consequences of drinking*, including any changes in your feelings or behavior while or after you were drinking, such as silliness, assertiveness, aggressiveness, or depression.

Analyze Your Record

Next analyze your record to detect patterns of feelings and environmental cues. Do you always drink when you're at a certain place or with certain people? Do you sometimes drink just to be sociable, when you don't really want a drink and would be satisfied with a nonalcoholic beverage? Refer to the list of warning signs of alcohol abuse given in the text. Are any of them true for you? For example, do you feel uncomfortable in a social situation if alcohol is *not* available?

Set Goals

Now that you've analyzed your record, think about whether you want to change any of your behaviors. Would you do better academically if you drank less? Has drinking had a negative impact on any of your relationships? Have you risked infection and unplanned pregnancy by having unprotected sex while drunk? Do you depend on alcohol in order to have a good time? Have you been injured while drinking? If you drink and drive or if you feel you are becoming dependent on alcohol, it is time to change your drinking behavior. Decide on goals that will give you the best health and safety returns, such as a beer or a glass of wine with dinner, one drink per hour at a party, or no alcohol at all.

Devise a Plan

Refer to your health journal to see what kinds of patterns your drinking falls into and where you can intervene to break the behavior chain. If you have determined that your life would be improved if you changed your drinking habits, now is the time to make changes. For some people, simple changes in the environment such as stocking the refrigerator with alternative beverages like juices or sparkling water can be helpful. If you feel self-conscious about ordering a nonalcoholic drink when you're out with a group, try recruiting a friend to do the same. If it's too difficult to avoid drinking in some situations, such as at a bar or a beer party, you may decide to avoid those situations for a period of time.

Examine your friendships. If drinking is becoming a problem for you and some of your friends drink heavily, you may need to think about letting those relationships go. If you find support groups helpful, check with your college counseling center or health clinic; most schools sponsor peer group activities for those who are working to change their drinking habits. Local chapters of AA and other organizations may have groups geared toward college-age people.

Instead of drinking, try other activities that produce the same effect. For example, if you drink to relieve anxiety or tension, try adding 20–30 minutes of exercise to your schedule to help manage stress. Or try doing a relaxation exercise or going for a brisk walk to help reduce anxiety before a party or date. If you drink to relieve depression or to stop worrying, consider finding a trustworthy person (perhaps a professional counselor) to talk to. If you drink to feel more comfortable sexually, consider ways to improve communication with your partner so you can deal with sexual issues more openly. When these activities are successful, they will reinforce your responsible drinking decisions and make it more likely that you'll make the same decisions again in the future.

For other ways to monitor and control your drinking behavior, see the suggestions in the section "Drinking Behavior and Responsibility."

Reward Yourself and Monitor Your Progress

If changing your drinking behavior turns out to be difficult, it may be a clue that drinking is becoming a problem for you—all the more reason to get it under control now. Be sure to reward yourself as you learn to drink responsibly (or not at all). You may lose weight, look better, feel better, and have higher self-esteem as a result. Keep track of your progress in your health journal, and use the strategies described in Chapter 1 for maintaining your program. Remember, when you establish sensible drinking habits, you're planning not just for this week or month—but for your whole life.

Tobacco Use



LOOKING AHEAD...

After reading this chapter, you should be able to

- List the reasons why people start using tobacco and why they continue to use it
- Explain the short- and long-term health risks associated with tobacco use
- Discuss the effects of environmental tobacco smoke on nonsmokers
- Describe the social costs of tobacco, and list actions that have been taken to combat smoking in the public and private sectors
- Prepare plans to stop using tobacco and to avoid environmental tobacco smoke

TEST YOUR KNOWLEDGE

1. "Light" or low-tar cigarettes are safer than regular cigarettes.
True or false?
2. Which of the following substances is (are) found in tobacco smoke?
 - a. Acetone (nail polish remover)
 - b. Ammonia (cleaner)
 - c. Hexamine (lighter fluid)
 - d. Toluene (industrial solvent)
3. Every day about 3000 Americans start smoking.
True or false?
4. Cigarette smoking increases the risk for which of the following conditions?
 - a. Facial wrinkling
 - b. Miscarriage
 - c. Impotence
5. A person who quits smoking now will reduce his or her risk of lung cancer within 10 years.
True or false?

ANSWERS

1. **FALSE.** Smokers who choose "light" or low-tar cigarettes do not reduce tar intake or smoking-related disease risks; nor is there any evidence that switching to "light" cigarettes helps smokers quit.
2. **ALL FOUR.** Tobacco contains thousands of chemical substances, including many that are poisonous or linked to the development of cancer.
3. **TRUE.** Roughly 850 Americans under age 18 and 2200 over age 18 start smoking every day in the United States.
4. **ALL THREE.** Cigarette smoking reduces the quality of life and is the leading preventable cause of death in the United States.
5. **TRUE.** The lung cancer rate of a former smoker is half that of a continuing smoker within 10 years of quitting.

Smoking is the leading cause of preventable death in the United States. According to estimates from the Centers for Disease Control and Prevention (CDC), about 443,000 Americans—nonsmokers as well as smokers—die prematurely from tobacco-related causes every year (Figure 11.1). Tobacco use accounts for nearly one of every five deaths.

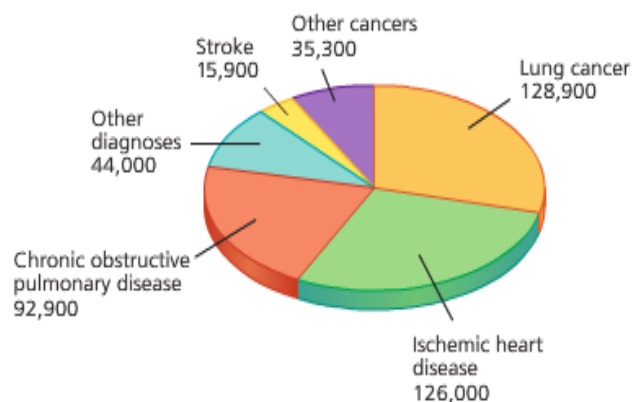
Smoking affects the health of people at all stages of life and from all walks of life. On average, smokers can expect to live about 14 years less than nonsmokers. But nonsmokers also suffer the effects of tobacco smoke, especially the children of parents who smoke. Exposure to environmental tobacco smoke (ETS) kills more than 49,000 nonsmokers every year. Despite these facts—and despite increasing public and private efforts to restrict smoking—nearly 70 million

Americans currently smoke. This number includes children, teens, and adults.

This chapter discusses the reasons why people use tobacco, the negative impacts of smoking, and the measures being taken to stop this public health threat.

WHO USES TOBACCO?

According to the 2010 National Survey on Drug Use and Health (NSDUH), an estimated 69.6 million Americans aged 12 or older reported using a tobacco product at least once in the preceding month. In particular, young adults aged 18 to 25 had the highest rate of current tobacco product use (40.8%). Based on early results from the 2011 National



VITAL STATISTICS

FIGURE 11.1 Annual mortality among cigarette smokers directly attributable to smoking: 2000–2004.

SOURCES: Centers for Disease Control and Prevention. 2008. Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000–2004. *Morbidity and Mortality Weekly Report* 57(45): 1226–1228; Centers for Disease Control and Prevention. 2010. *Smoking and Tobacco Use: Annual Deaths Attributable to Cigarette Smoking—United States, 2000–2004* (http://www.cdc.gov/tobacco/data_statistics/tables/health/attrdeaths/index.htm); Centers for Disease Control and Prevention. 2012. *Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC)*.

Health Interview Survey, nearly 20% of Americans aged 18 and older described themselves as current smokers, meaning they smoke cigarettes every day or most days.

Smoking rates reported in such surveys are essentially unchanged from those reported in 2004, suggesting that a decades-long decline in smoking prevalence has stalled. Until 2004, smoking rates had dropped steadily from a high of roughly 42% in 1964, when a report from the U.S. Surgeon General linked smoking and lung cancer.

According to the 2011 National Health Interview Survey, about 21.5% of men and 17.3% of women reported that they currently smoked cigarettes (Table 11.1). Rates of smoking varied based on gender, age, ethnicity, and education level (see the box “Smoking among Ethnic Populations”). Adults with less than a 12th-grade education were much more likely to smoke cigarettes than those with a college degree.

For more than a decade, there has been a gradual increase in the number of “occasional smokers” (people who smoke on some days but not daily). Most such smokers are young adults aged 18–25 who say they smoke only at parties or when they are with friends who smoke. Health officials warn that occasional smokers are as vulnerable as other smokers to the health dangers of tobacco. Occasional smokers are also less likely to try to quit.

Young People and Tobacco

As of June 2010, new federal regulations made it a federal crime to sell tobacco products to anyone under 18 years of age. Even so, minors smoke an estimated 800 million packs of cigarettes

Table 11.1 Who Smokes?

	PERCENTAGE OF SMOKERS		
	MEN	WOMEN	TOTAL
Ethnic Group (Age ≥ 18)			
White	22.6	19.6	21.0
Black	24.8	17.1	20.6
Asian	14.7	4.3	9.2
American Indian/ Alaskan Native	N/A	36	31.4
Latino	15.8	9.0	12.5
Education (Age ≥ 25)			
≤ 8 years	20.3	11.2	16.2
9–11 years	38.3	29.8	33.8
12 years (no diploma)	22.4	21.2	21.7
GED	46.4	44.1	45.2
High school graduate	27.4	20.6	23.8
Associate degree	21.8	16.4	18.8
Undergraduate degree	10.2	9.5	9.9
Graduate degree	7.1	5.4	6.3
Total	21.5	17.3	19.3
SOURCE: Centers for Disease Control and Prevention. 2011. Vital signs: current cigarette smoking among adults aged ≥18 years—United States, 2005–2010. <i>Morbidity and Mortality Weekly Report</i> 60(35): 1189–1232.			

each year; more than half of these cigarettes are purchased at retail stores.

Each day roughly 1000 teenagers become regular smokers; at least one-third of them will die prematurely because of tobacco. According to the 2011 Monitoring the Future survey, nearly one-fifth of American teens become current smokers (meaning they smoke at least one cigarette per month) by the time they leave high school (Figure 11.2). Although cigarette use is at historically low rates among teens, smoking rates are declining much more slowly than in past years.

QUICK STATS

**2.0 million
Americans aged
12–17 are current
tobacco users.**

—SAMHSA, 2011

Gender and Smoking

American men are currently more likely than women to smoke, but women younger than age 23 are becoming smokers at a faster rate than any other population segment. When women decide to try to stop smoking, they are more likely than men to join a support group. Overall, though, women are less successful than men in quitting. Women report more severe withdrawal symptoms when they stop smoking and are more likely than men to report cravings in response to social and behavioral cues associated with smoking.

For men, relapse to smoking is often associated with work or social pressure; women are more likely to relapse when sad or depressed or concerned about weight gain. Women and men also respond differently to medications: nicotine replacement therapy appears to work better for men, whereas the non-nicotine medication bupropion appears to work better for women.



DIVERSITY MATTERS

Smoking among Ethnic Populations

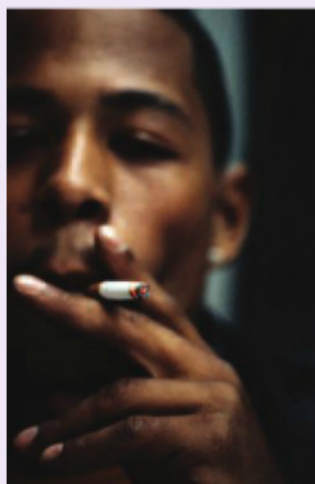
The overall rate of current tobacco use among Americans aged 12 and older was 27.4% in 2010. So, on average, any group of 12 people is likely to include 3 or 4 who use tobacco. But averages include wide variations among populations, and ethnic differences appear in the earliest stages of tobacco use.

Nearly 20% of all U.S. high school students described themselves as “current cigarette users” in 2009. African American students (9.5%) were less likely than either whites (22.5%) or Latinos (18.0%) to smoke in high school. Similarly, far more white students (9.5%) described themselves as “frequent” smokers than did Latinos (4.2%) or blacks (2.1%).

The use of smokeless tobacco shows an even greater disparity. White high school students are nearly four times more likely to use spit tobacco than are African American students, and about twice as likely as Latino students. White students (14.9%) smoke cigars only slightly more often than black students (12.8%) or Latino students (12.7%).

Wide ethnic variations also exist among smokers over 18 years old. About 23% of American Indian and Alaska Native adults are smokers. Only 12% of Asian American adults smoke—about half the rate for the general population.

Within broad ethnic categories, even greater variation occurs. Among people grouped under the broad category of Latinos, 30% of Puerto Ricans but only 19% of Central or South Americans are smokers. There are higher smoking rates among population groups who trace their origins to Southeast Asia (for example, Vietnam, Cambodia, or Laos) than among other population groups within the general



Asian American grouping (for example, people from the Philippines, China, or Japan). Time in the United States, English proficiency, and level of educational attainment also influence smoking rates.

In populations of Asian and Pacific Islander Americans, rates of smoking are much higher among men than among women, regardless of country of origin. Although smoking among women decreases with age in the general population, smoking rates among Asian and Pacific Islander women increase with age. Asian and Pacific Islander Americans, male and female, who smoke tend to smoke fewer cigarettes per day (half a pack daily or less) than whites who smoke.

The variations between and within ethnic populations reflect a complex interplay of social, environmental, and cultural factors. For example, in some Latino populations, strong parental disapproval of smoking, particularly for girls, holds down the rate of smoking initiation. For other groups, smoking may have a mature and masculine aura, thereby promoting smoking. Socioeconomic factors may

limit access to stop-smoking programs; prevention programs may also not be available to non-English-speaking groups.

Tobacco companies understand the value of marketing strategies based on ethnic, cultural, age, and other differences. In 2004 a New York Supreme Court justice ruled that Brown & Williamson Tobacco Company was illegally appealing to young people with its “Kool MIXX” marketing campaign, which focused on hip-hop music and culture. R. J. Reynolds Tobacco Company (RJRT) extensively marketed its “Exotic Blends”—fruit- and spice-flavored, premium-priced, and imaginatively packaged versions of Camel cigarettes—to minority communities and to women. To increase cigarette sales among women and girls, tobacco companies have invested heavily in research on how women view themselves, their aspirations, and the social pressures they face. For example, according to internal tobacco industry documents, Philip Morris intentionally attempted to soften women’s attitudes toward tobacco use by strategically donating to women’s organizations, participating in women’s forums, and engaging with women they identified as “active moms.”

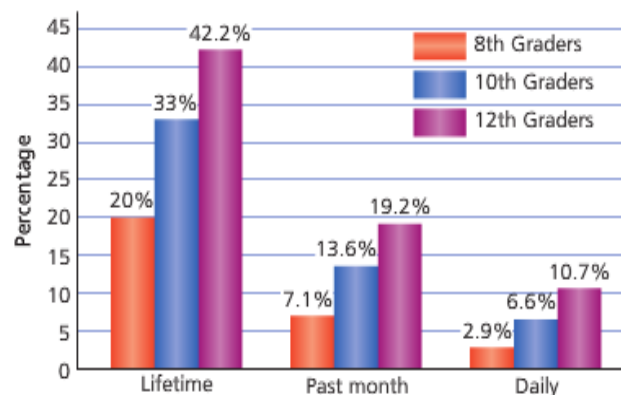
SOURCES: Substance Abuse and Mental Health Services Administration. 2011. *Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration, NSDUH Series H-41, HHS Publication No. SMA 11-4658; Centers for Disease Control and Prevention. 2004. Prevalence of cigarette use among 14 racial/ethnic populations—United States, 1990–2001. *Morbidity and Mortality Weekly Report* 53(3): 49–52; Centers for Disease Control and Prevention. 2010. Youth risk behavior surveillance—United States, 2009. *Morbidity and Mortality Weekly Report* 59(SS-5): 1–148.

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Tobacco and Other Drugs

Men and women with other drug abuse problems frequently use tobacco. For example, studies show that roughly 80% of alcoholics and more than 90% of heroin addicts are heavy smokers.

Smoking also is more prevalent among people with mental disorders than among the rest of the population: 40% of people with major depression, social phobias, and generalized anxiety disorder are smokers, as are 80% of people with schizophrenia. Such findings suggest that underlying psychological



VITAL STATISTICS

FIGURE 11.2 Cigarette use among 8th, 10th, and 12th graders in 2010.

SOURCE: National Institute on Drug Abuse. 2011. *Monitoring the Future Study: Trends in Prevalence of Various Drugs for 8th-Graders, 10th-Graders, and 12th-Graders, 2007–2010* (<http://www.drugabuse.gov/related-topics/trends-statistics/monitoring-future/trends-in-prevalence-various-drugs>).

or physiological traits may predispose people to drug use, including tobacco.

WHY PEOPLE USE TOBACCO

Although people start smoking for a variety of reasons, they usually become long-term smokers after becoming addicted to nicotine—the key psychoactive ingredient in tobacco smoke.

Nicotine Addiction

The primary reason why people continue to use tobacco is that they have become addicted to a powerful psychoactive drug: **nicotine**. Although the tobacco industry long maintained that nicotine had not been proved to be addictive, scientific evidence overwhelmingly shows that nicotine is highly addictive. Many researchers consider nicotine to be the most physically addictive of all the psychoactive drugs, including cocaine and heroin.

Some neurological studies indicate that nicotine acts on the brain in much the same way as cocaine and heroin. Nico-

tine reaches the brain via the bloodstream seconds after it is inhaled or, in the case of spit tobacco, absorbed through membranes of the mouth or nose. It triggers the release of powerful chemical messengers in the brain, including epinephrine, norepinephrine, and dopamine. But unlike street drugs, most of which are used to achieve a high, nicotine's primary attraction seems to lie in its ability to modulate everyday emotions.

At low doses, nicotine acts as a stimulant. It increases heart rate and blood pressure. In adults, nicotine can enhance alertness, concentration, information processing, memory, and learning. The opposite effect, however, occurs in teens who smoke; they show impairment in memory and other cognitive functions.

In some circumstances, nicotine acts as a mild sedative. Most commonly, nicotine relieves symptoms such as anxiety, irritability, and mild depression in tobacco users who are experiencing withdrawal. Some studies have shown that high doses of nicotine and rapid smoking cause increases in levels of glucocorticoids and endorphins, chemicals that act in the brain to moderate moods and reduce stress. Tobacco users are able to fine-tune nicotine's effects and regulate their moods by increasing or decreasing their intake of the drug. Studies have shown that smokers experience milder mood variation than nonsmokers while performing long, boring tasks or while watching emotional movies, for example.

All tobacco products contain nicotine, and using any of them can lead to addiction (see the box "Nicotine Dependence: Are You Hooked?"). Nicotine addiction fulfills the criteria for substance dependence described in Chapter 9, including loss of control, tolerance, and withdrawal.

Loss of Control About 69% of smokers say they want to quit completely, and about 52.4% of smokers try to quit each year. The majority (93.8%) of smokers who attempt to quit start smoking again within a year. Quitting may be even harder for smokeless users: in one study, only 1 of 14 spit tobacco users who participated in a tobacco cessation clinic was able to stop for more than four hours.

Regular tobacco users live according to a rigid cycle of need and gratification. On average, they can go no more than 40 minutes between doses of nicotine; otherwise they begin feeling edgy and irritable and have trouble concentrating. If ignored, nicotine cravings build until getting tobacco becomes a paramount concern, crowding out other thoughts. Tobacco users may plan their daily schedule around opportunities to satisfy their nicotine cravings; this loss of control and personal freedom can affect all the dimensions of wellness.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do any of your friends or family members smoke or use smokeless tobacco? What effect has it had on their health and relationships? Have you ever discussed their tobacco use with them? Why or why not?

tobacco The leaves of cultivated tobacco plants prepared for smoking, chewing, or use as snuff.

nicotine A poisonous, addictive substance found in tobacco and responsible for many of the effects of tobacco.

TERMS



ASSESS YOURSELF

Nicotine Dependence: Are You Hooked?

If you smoke, answer each question in the following list, giving yourself the appropriate number of points.

- _____ 1. How soon after waking up do you have your first cigarette?
 - a. Within 5 minutes (3)
 - b. 6–30 minutes (2)
 - c. 31–60 minutes (1)
 - d. After 60 minutes (0)
 - _____ 2. Do you find it difficult to refrain from smoking in places where it is forbidden, such as the library, a theater, or a doctor's office?
 - a. Yes (1)
 - b. No (0)
 - _____ 3. Which cigarette would you most hate to give up?
 - a. The first one in the morning (1)
 - b. Any other (0)
 - _____ 4. How many cigarettes a day do you smoke?
 - a. 10 or fewer (0)
 - b. 11–20 (1)
 - c. 21–30 (2)
 - d. 31 or more (3)
 - _____ 5. Do you smoke more frequently during the first hours after waking than during the rest of the day?
 - a. Yes (1)
 - b. No (0)
 - _____ 6. Do you smoke if you are so ill that you are in bed most of the day?
 - a. Yes (1)
 - b. No (0)
- TOTAL _____

SCORING

A total score of 7 or more indicates that you are very dependent on nicotine and are likely to experience withdrawal symptoms when you stop smoking.

A score of 6 or less indicates low to moderate dependence.

SOURCE: Heatherton, T. F., et al. 1991. The Fagerstrom Test for Nicotine Dependence: a revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addictions* 86(9): 1119–1127.

Tobacco users become adept at keeping a steady amount of nicotine circulating in the blood and going to the brain. In one experiment, smokers were given cigarettes that looked and tasted alike but varied in nicotine content. The subjects automatically adjusted their rate and depth of inhalation so that they absorbed their usual amount of nicotine. In other studies, heavy smokers were given nicotine without knowing it, and they cut down on their smoking without a conscious effort. Spit tobacco users maintain blood nicotine levels as high as those of cigarette smokers.

Spit tobacco users maintain blood nicotine levels as high as those of cigarette smokers.

muscle pains, headache, nausea, irritability, anger, and depression. Users undergo measurable changes in brain waves, heart rate, and blood pressure, and they perform poorly on tasks requiring sustained attention. Although most of these symptoms of physical dependence pass in two or three days, the craving associated with addiction persists. Many ex-smokers report intermittent, intense urges to smoke for years after quitting.

Tolerance and Withdrawal Tobacco users build up tolerance to nicotine. Whereas one cigarette may make a beginning smoker nauseated and dizzy, a long-term smoker may have to chain-smoke a pack or more to experience the same effects. For most regular tobacco users, sudden abstinence from nicotine produces predictable withdrawal symptoms. These symptoms, which come on several hours after the last dose of nicotine, can include severe cravings, insomnia, confusion, tremors, difficulty concentrating, fatigue,

Social and Psychological Factors

Why do tobacco users have such a hard time quitting even when they want to? Social and psychological forces combine with physiological addiction to maintain the tobacco habit. Many people, for example, have established habits of smoking while doing something else—while talking, working, drinking, and so on. The spit tobacco habit is also associated with certain situations—studying, drinking coffee, or playing sports. These associations can make it more difficult for users to break their habits because the activities they associate with tobacco use continue to trigger their urge. Such

activities are called **secondary reinforcers**; they act together with the physiological addiction to keep the user dependent on tobacco.

Genetic Factors

Inherited characteristics play an important role in some aspects of tobacco use. Genetic factors may be more important than social and environmental factors in smoking initiation and in the development of nicotine dependence.

For example, a gene that influences the way in which nicotine is metabolized, or broken down in the body, helps regulate the activity of an enzyme called CYP2A6. When people with slow CYP2A6 metabolism use tobacco, the nicotine remains in their blood longer than in people who have the gene for a faster-metabolizing form of the enzyme. The slow metabolizers are more likely to feel nausea or dizziness when they first use tobacco, are less likely to continue smoking if they try it, and find it easier to quit if they do become regular smokers.

Scientists have also shown that a gene called DRD2 (associated with the brain chemical dopamine, which plays a key role in the pleasurable effects of nicotine) appears to influence the progression of smoking in adolescence. Among 10th graders who took one puff of a cigarette, those with one form of the gene were more than three times as likely as those with the other form to be regular smokers when they finished the 11th grade.

Why Start in the First Place?

In the United States, nearly 90% of all adult smokers started smoking before age 18. Every day 850 Americans under the age of 18 start smoking; about 2200 Americans aged 18 and older begin smoking each day, as well. The average age for starting smokers and smokeless tobacco users is around 15. The earlier people begin smoking, the more likely they are to become heavy smokers—and to die of tobacco-related disease.

Not all young people are equally vulnerable to the lure of tobacco. Research suggests that the more of the following characteristics that apply to a child or adolescent, the more likely he or she is to use tobacco:

- A parent or sibling uses tobacco
- Peers use tobacco
- The child comes from a blue-collar family
- The child comes from a low-income home

Nicotine addiction can start within a few days of smoking and after just a few cigarettes.

secondary reinforcers Stimuli that are not necessarily pleasurable in themselves but that are associated with other stimuli that are pleasurable.

TERMS



Most adult smokers began as teenagers.

- The family is headed by a single parent
- The child performs poorly in school
- The child drops out of school
- The child has positive attitudes about tobacco use

Young people start using tobacco for a variety of reasons. Many young, white, male athletes, for example, begin using spit tobacco to emulate professional athletes. Young women commonly take up smoking because they think it will help them lose weight or stay thin. Most often, however, young people start smoking simply because their peers are already doing it; smoking gives them a way to fit in with a crowd or to look cool.

Rationalizing the Dangers Making the decision to smoke requires minimizing or denying both the health risks of tobacco use and the tremendous pain, disability, emotional trauma, family stress, and financial expense involved in tobacco-related diseases such as cancer and emphysema. A sense of invincibility, characteristic of many adolescents and young adults, also

contributes to the decision to use tobacco. Young people may persuade themselves they are too intelligent, too lucky, or too healthy to be vulnerable to tobacco's dangers.

Many teenagers believe they can stop smoking when they want. In fact, adolescents are more vulnerable to nicotine than are older tobacco users. Compared with older smokers, adolescents become heavy smokers and develop dependence after fewer cigarettes. Nicotine addiction can start within a few days of smoking and after just a few cigarettes. Over half of teenagers who try cigarettes progress to daily use, and about half of those who ever smoke daily progress to nicotine dependence. In polls, about 75% of smoking teens state they wish they had never started. Another survey revealed that only 5% of high school smokers predicted they would definitely be smoking in five years; in fact, close to 75% were smoking seven to nine years later.

Emulating Smoking in the Media

Both the Institute of Medicine and the National Cancer Institute have identified media portrayals of smoking as a key influence on young people who start smoking. In fact, studies by the National Cancer Institute have concluded that a direct causal relationship exists between media portrayals of smoking and actual smoking initiation by young moviegoers. A study conducted by researchers at the Dartmouth Medical School found that more than 50% of young people surveyed began smoking after watching repeated favorable portrayals of smoking in movies.

In general, the portrayal of smoking in films does not reflect U.S. patterns of tobacco use. The prevalence of smoking among lead characters is three to four times that among comparable Americans. Films typically show smokers as white, male, well educated, successful, and attractive. In reality, smokers tend to be poor and to have less education. Public

campaigns to reduce images of smoking in movies have succeeded to an extent; smoking is shown less often in film and television shows now than even just a few years ago. Still, anti-smoking advocates say that films are still a critical and highly successful form of advertising for the tobacco industry (see the box “Tobacco Advertising”).

Some groups suggest an automatic “R” rating for any film that shows tobacco use. Such a system would equate smoking with violence, strong language, sexuality, and nudity in determining a film’s rating.

HEALTH HAZARDS

Tobacco adversely affects nearly every part of the body, including the brain, stomach, mouth, and reproductive organs.

QUICK

STATS

**323 billion
cigarettes were
sold in the United
States in 2008.**

—Federal Trade Commission, 2011

Tobacco Smoke: A Toxic Mix

Tobacco smoke contains thousands of chemical substances, several hundred of which are known to be harmful to humans, including acetone (nail polish remover), ammonia, hexamine (lighter fluid), and toluene (industrial solvent). Smoke from a

typical unfiltered cigarette contains about 5 billion particles per cubic millimeter—50,000 times as many as are found in an equal volume of smoggy urban air. These particles, when condensed, form a brown, sticky mass called **cigarette tar**.

Carcinogens and Poisons At least 69 chemicals in tobacco smoke are linked to the development of cancer. Some, such as benzo(a)pyrene and urethane, are **carcinogens**—that is, they directly cause cancer. Other chemicals, such as



Anti-smoking advocates commonly criticize movies for their inclusion of characters who use tobacco.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What has influenced your decision to smoke, not to smoke, or to quit smoking? Have you ever felt that images or messages in the media were encouraging you to use tobacco? How do you react to such messages?

cigarette tar A brown, sticky mass created when the chemical particles in tobacco smoke condense.

carcinogen Any substance that causes cancer.

TERMS

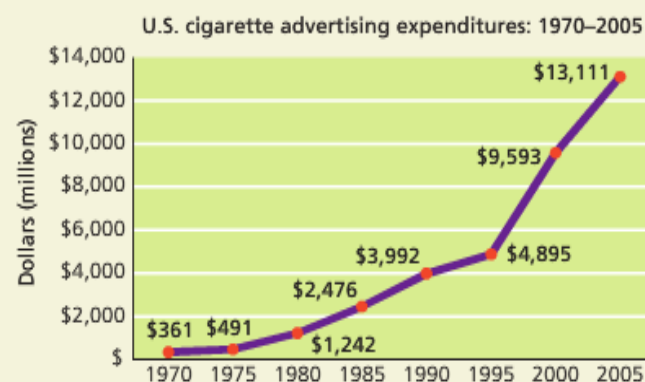
CRITICAL CONSUMER Tobacco Advertising



Advertising is a powerful influence. In 2008 the tobacco industry spent nearly \$10 billion (see the accompanying chart) on marketing, much of it in the form of advertising that portrayed users as confident, popular, fit, and sexually attractive. That same year, the Federal Trade Commission estimated that Americans smoked about 323 billion cigarettes.

Young people are a prime target of tobacco ads because nicotine addiction can lead to a lifetime of purchasing tobacco. Young smokers are most likely to buy familiar brands. The most heavily advertised cigarettes are the choice of 90% of teen smokers. In the 1980s and 1990s, for example, R.J. Reynolds Tobacco Company's promotion of the Camel brand recruited millions of new smokers—many of them teenagers or younger. In surveys, more than 90% of 6-year-olds recognized the Camel character ("Joe Camel"), who became as familiar to children as Mickey Mouse.

Cigarette ads don't target only children. Certain brands are designed to appeal primarily either to men or to women, or to a specific ethnic group. Magazines that target African American audiences, for example, receive proportionately more revenues from cigarette ads than do other consumer magazines. Bill-



formaldehyde, are **cocarcinogens**; they do not themselves cause cancer but combine with other chemicals to stimulate the growth of certain cancers, at least in laboratory animals. Other substances in tobacco cause health problems because they damage the lining of the respiratory tract or decrease the lungs' ability to fight off infection.

Tobacco also contains poisonous substances, including arsenic and hydrogen cyanide. In addition to being an addictive psychoactive drug, nicotine is a poison that can be fatal in high doses. Many cases of nicotine poisoning occur each year in toddlers and infants who eat cigarette butts they find at home or on the playground.

cocarcinogen A substance that works with a carcinogen to cause cancer.

TERMS

boards advertising tobacco products are placed in black communities four or five times more often than in primarily white communities.

The federal government began regulating tobacco advertising in 1967, requiring broadcasters to air anti-smoking messages along with cigarette advertisements. Within a few years, cigarette consumption dropped by 7%. Broadcast ads for cigarettes were banned in 1971.

In 1998 controls on tobacco advertising were enacted as part of a deal to settle lawsuits brought against the tobacco industry by the attorneys general of 39 states. This settlement limits or bans the following types of marketing tools:

- Billboard and transit ads for tobacco products.
- The use of cartoon characters in ads and on packaging.
- Tobacco logos on T-shirts, hats, and other promotional items.
- Brand-name sponsorship of sporting events.
- Product placement in movies, TV shows, and concerts.

Regardless, the tobacco industry spends billions to promote its product. Much of this money is spent on print ads and coupons, but a great deal is also given to retailers to help offset ever-increasing taxes levied on tobacco products by states.

The industry's promotional efforts are most apparent in convenience stores, where tobacco products and promotions are prominently placed at checkout counters. Tobacco products are presented as a colorful and commonplace part of the retail environment—as acceptable as a candy bar or a carton of milk.

Cigarette smoke contains carbon monoxide, the deadly gas in automobile exhaust, in concentrations 400 times greater than is considered safe in industrial workplaces. Not surprisingly, smokers often complain of breathlessness when they require a burst of energy to climb stairs or lift something. Carbon monoxide displaces oxygen in red blood cells, depleting the body's supply of oxygen needed for extra work. Carbon monoxide also impairs visual acuity, especially at night.

Additives Tobacco manufacturers use additives to manipulate the taste and effect of cigarettes and other tobacco products. Additives account for roughly 10%, by weight, of a cigarette, and include sugars and other flavoring agents, humectants (compounds that keep tobacco from drying out), and chemicals that enhance the addicting properties of nicotine.

Added sugars—including licorice, cocoa, and honey—have a dual role. As flavor enhancers, sugars mask the harsh, bitter

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Cigarette making is an elaborate process involving industrial machinery and chemistry. Dozens of compounds may be added to tobacco to produce a specific brand of cigarette.

taste of tobacco, so smokers can inhale more smoke and absorb more nicotine. When sugars burn, they produce acetaldehyde, a carcinogen that also enhances the addictive effect of nicotine.

Other flavor components, such as theobromine and glycyrrhizin, act as bronchodilators, opening the lungs' airways and making it easier for nicotine to get into the bloodstream.

Ammonia plays a complex role in tobacco products, but its chief purpose is to boost the amount of addictive nicotine delivered by cigarettes. Ammonia reduces the acidity of tobacco smoke and releases nicotine in the form of a base (alkaline) rather than a salt (acid) bound to other acid components of smoke. As a free base, nicotine is more readily absorbed into the blood.

Some additives are intended to make **sidestream smoke** (the uninhaled smoke from a burning cigarette) less obvious and objectionable. For example, potassium citrate, aluminum, and clay are added to cigarette wrappers to convert particulate ash into an invisible gas with less irritating odor than would

be given off by a conventional paper wrapper. These additives serve no purpose in making cigarettes more desirable and addicting to the smoker; instead they are intended to reduce social pressures from nonsmokers.

Nearly 600 chemicals, approved as safe when used as food additives, are used in manufacturing cigarettes. In 1994 U.S. cigarette manufacturers submitted a list of tobacco additives to the Department of Health and Human Services, which made the list public and accompanied it with the notice that "although these ingredients are regarded as safe when ingested in foods, some may form carcinogens when heated or burned."

Inhaling Tobacco Smoke All smokers absorb some gases, tar, and nicotine from cigarette smoke, but smokers who inhale bring most of these substances into their bodies and keep them there. According to the U.S. Surgeon General, anyone who inhales cigarette smoke (either directly or secondhand) is inhaling more than 7000 chemicals—some of which are hazardous, and 69 of which are known carcinogens. In a year, a typical pack-a-day smoker takes in 50,000–70,000 puffs. Smoke from a cigarette, pipe, or cigar directly assaults the mouth, throat, and respiratory tract. The nose, which normally filters about 75% of foreign matter we breathe, is completely bypassed.

In a cigarette, the unburned tobacco itself acts as a filter. As a cigarette burns down, there is less and less filter. Thus more chemicals are absorbed into the body during the last third of a cigarette than during the first. A smoker can cut down on the absorption of harmful chemicals by not smoking cigarettes down to short butts. Any gains, of course, are offset by smoking more cigarettes, inhaling more deeply, or puffing more frequently.

"Reduced Harm" Cigarettes Some smokers prefer low-tar, low-nicotine, or filtered cigarettes because they believe them to be less dangerous alternatives. The tobacco industry has long promoted such products as "reduced harm" cigarettes, meaning they are supposedly less damaging to their users' health. But there is no such thing as a safe cigarette, and smoking behavior is a more important factor in tar and nicotine intake than the type of cigarette smoked. Smokers who switch to a low-nicotine brand often compensate by smoking more cigarettes, inhaling more deeply, taking larger or more frequent puffs, or blocking ventilation holes with lips or fingers to offset the effects of filters.

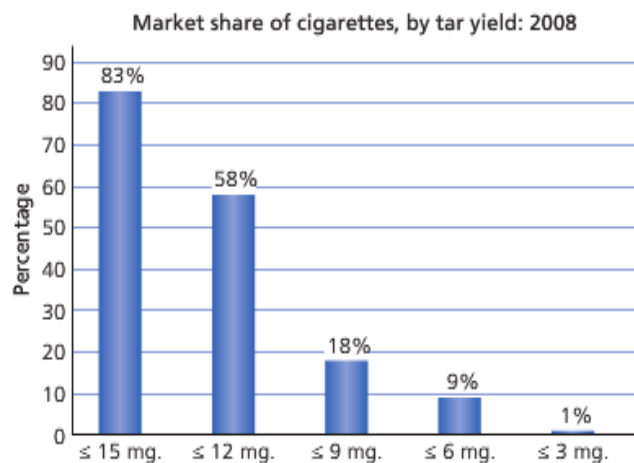
Studies have found that people who smoke "light" cigarettes inhale up to eight times as much tar and nicotine as printed on the label. Studies also show that smokers of light cigarettes are less likely to quit than smokers of regular cigarettes, probably due to the misperception that light cigarettes are safer. Use of "light" and low-tar cigarettes does not reduce the risk of smoking-related illnesses.

In June 2010 federal regulations prohibited cigarette manufacturers from labeling their products with descriptors such as "light," "mild," or "low"—terms that have effectively convinced

Federal law prohibits the use of terms such as "light" and "mild" on cigarette packaging.

sidestream smoke The uninhaled smoke from a burning cigarette.

TERMS



VITAL STATISTICS

FIGURE 11.3 U.S. market share of cigarettes, by tar level: 2008.

SOURCE: Federal Trade Commission. 2011. *Federal Trade Commission Cigarette Report for 2007 and 2008*. Washington, DC: Federal Trade Commission.

many consumers that such cigarettes are safer alternatives to higher-tar cigarettes. Manufacturers who want to apply such labels have to receive special permission from the U.S. Food and Drug Administration. Despite the availability of lower-tar cigarettes, consumers heavily favor higher-tar products; as shown in Figure 11.3, high-tar cigarettes (containing up to 15 mg of tar per cigarette) made up nearly 83% of the domestic cigarette market in 2008, greatly outselling lower-tar varieties.

Menthol Cigarettes Concerns have also been raised about menthol cigarettes. Menthol is a bronchodilator; as mentioned earlier, bronchodilators open the lungs' airways and make it easier for nicotine to enter the bloodstream. About 70% of African American smokers smoke these cigarettes, as compared to 30% of whites. Studies have found that blacks absorb more nicotine than other groups and metabolize it more slowly; they also have lower rates of successful quitting. The anesthetizing effect of menthol, which may allow smokers to inhale more deeply and hold smoke in their lungs for a longer period, may be partly responsible for these differences. Research is needed to determine if the effects of menthol and differences in smoking behavior can help explain the higher rates of smoking-related diseases among blacks.

The Immediate Effects of Smoking

The beginning smoker often has symptoms of mild nicotine poisoning, including the following:

- Dizziness
- Faintness
- Rapid pulse
- Cold, clammy skin

- Nausea
- Vomiting
- Diarrhea

The seasoned smoker occasionally suffers these effects of nicotine poisoning, particularly after quitting and then returning to a previous level of consumption. The effects of nicotine on smokers vary, depending greatly on the size of the nicotine dose and how much tolerance one has built up through previous smoking. Nicotine can either excite or tranquilize the nervous system, depending on dosage. (See page T1-3 of the color transparency insert "Touring Lifestyle Behaviors" in Chapter 10.)

Nicotine has many other immediate effects. It stimulates the part of the brain called the **cerebral cortex**. It also stimulates the adrenal glands to discharge adrenaline. Nicotine inhibits the formation of urine; constricts the blood vessels, especially in the skin; accelerates the heart rate; and elevates blood pressure. Higher blood pressure, faster heart rate, and constricted blood vessels require the heart to pump more blood. In healthy people, the heart can usually meet this demand; but in people whose coronary arteries are damaged enough to interfere with the flow of blood, the heart muscle may be strained.

Smoking depresses hunger sensations and dulls the taste buds. Smokers who quit often notice that food tastes much better. Smoking is not useful for weight loss, however. Smoking for decades may lessen or prevent age-associated weight gain for some smokers, but for people under 30, smoking is not associated with weight loss.

The Long-Term Effects of Smoking

Smoking is linked to many deadly and disabling diseases. Research indicates that the total amount of tobacco smoke inhaled is a key factor contributing to disease. People who smoke more cigarettes per day, inhale deeply, puff frequently, smoke cigarettes down to the butts, or begin smoking at early ages run a greater risk of disease than do those who smoke more moderately or who do not smoke at all.

As more research is done, even more diseases associated with smoking are being uncovered. The costliest ones—to society as well as to the individual—are cardiovascular disease, cancer, and respiratory diseases.

Cardiovascular Disease Although lung cancer tends to receive the most publicity, one form of cardiovascular disease, **coronary heart disease (CHD)**, is actually the most widespread single cause of death for cigarette smokers. CHD

cerebral cortex The outer layer of the brain, which controls complex behavior and mental activity.

coronary heart disease (CHD) Cardiovascular disease caused by hardening of the arteries that supply oxygen to the heart muscle; also called *coronary artery disease*.

TERMS

often results when the arteries that supply the heart muscle with blood develop **atherosclerosis**. In atherosclerosis, fatty deposits called **plaques** form on the inner walls of arteries, causing them to narrow and stiffen. Smoking and exposure to environmental tobacco smoke (ETS) permanently accelerate the rate of plaque accumulation in the coronary arteries—50% for smokers, 25% for ex-smokers, and 20% for people regularly exposed to ETS. The crushing chest pain of **angina pectoris**, a primary symptom of CHD, results when the heart muscle, or **myocardium**, does not get enough oxygen. Sometimes a plaque forms at a narrow point in a main coronary artery. If the plaque completely blocks the flow of blood to a portion of the heart, that portion may die. This type of heart attack is called a **myocardial infarction**.

CHD can also interfere with the heart's electrical activity, resulting in disturbances of the normal heartbeat rhythm. Sudden and unexpected death is a common result of CHD, particularly among smokers. (See Chapter 15 for a more extensive discussion of cardiovascular disease.)

Smokers have a death rate from CHD that is 70% higher than that of nonsmokers. Deaths from CHD associated with cigarette smoking are most common in people aged 40–50. (In contrast, deaths from lung cancer caused by smoking are most likely to occur in 60–70-year-olds.) Among people under age 40, smokers are five times more likely than nonsmokers to have a heart attack. Cigar and pipe smokers run a lower risk than cigarette smokers.

We do not completely understand how cigarette smoking increases the risk of CHD, but researchers are beginning to shed light on the process. Smoking reduces the amount of “good” cholesterol (high-density lipoprotein, or HDL) in the blood, thereby promoting plaque formation in artery walls. Smoking may also increase tension in heart muscle walls, speeding up the rate of muscular contraction and accelerating the heart rate. The workload of the heart thus increases, as does its need for oxygen and other nutrients. Carbon monoxide produced by cigarette smoking combines with hemoglobin in the red blood cells, displacing oxygen and thus providing less oxygen to the heart. One study showed that the additional blood supply available to the heart during stress was 21% less in smokers than in nonsmokers. This reduced blood flow is an early indicator of future heart attacks or strokes.

QUICK STATS

Smoking accounts for at least 30% of cancer deaths and 80% of all lung cancer deaths.

—American Cancer Society, 2012

atherosclerosis Cardiovascular disease caused by the deposit of fatty substances (called *plaque*) in the walls of the arteries.

plaque A deposit on the inner wall of blood vessels; blood can coagulate around plaque and form a clot.

angina pectoris Chest pain due to coronary heart disease.

myocardial infarction A heart attack caused by the complete blockage of a main coronary artery.

The risks of CHD decrease rapidly when a person stops smoking. This is particularly true for younger smokers, whose coronary arteries have not yet been extensively damaged.

Cigarette smoking has been linked to other cardiovascular diseases, including the following:

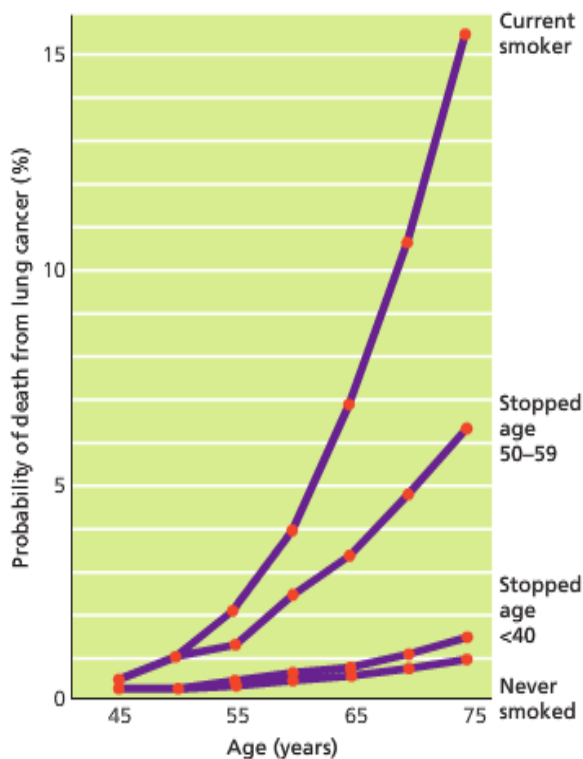
- **Stroke:** a sudden interference with the circulation of blood in a part of the brain, resulting in the destruction of brain cells.
- **Aortic aneurysm:** a bulge in the aorta caused by a weakening in its walls.
- **Pulmonary heart disease:** a disorder of the right side of the heart, caused by changes in the blood vessels of the lungs.

Lung Cancer and Other Cancers Cigarette smoking is the primary cause of lung cancer. Research has identified the precise mechanism: benzo(a)pyrene, a chemical found in tobacco smoke, causes genetic mutations in lung cells that are identical to those found in many patients with lung cancer. Those who smoke two or more packs of cigarettes a day have lung cancer death rates 12–25 times greater than those of nonsmokers. The dramatic rise in lung cancer rates among women in the past 40 years clearly parallels the increase of smoking in this group; lung cancer now exceeds breast cancer as the leading cause of cancer deaths among women. The risk of developing lung cancer increases with the number of cigarettes smoked each day and the number of years of smoking. The risk is inversely proportional to the age at which the person started smoking: the younger you start smoking, and the longer you continue, the greater your risk of developing a smoking-related cancer. But as Figure 11.4 shows, the younger a smoker stops smoking, the lower his or her risk of ultimately dying from lung cancer. Evidence suggests that after 1 year without smoking, the risk of lung cancer decreases substantially. After 10 years, the risk of lung cancer among ex-smokers is 50% lower than that of continuing smokers.

While cigar and pipe smokers have a higher risk of lung cancer than nonsmokers do, their risk is lower than that for cigarette smokers. Smoking filter-tipped cigarettes slightly reduces health hazards unless the smoker compensates by smoking more, as is often the case.

Research has also linked smoking to cancers of the trachea, mouth, pharynx, esophagus, larynx, pancreas, bladder, kidney, breast, cervix, stomach, liver, colon, and skin. For more information about cancer, see Chapter 16.

Chronic Obstructive Pulmonary Disease A smoker's lungs are constantly exposed to dangerous chemicals and irritants, so they must work harder to function adequately. The stresses placed on the lungs by smoking can permanently damage lung function and lead to *chronic obstructive pulmonary disease (COPD)*, also known as chronic obstructive lung disease (COLD), or chronic lower respiratory disease.



VITAL STATISTICS

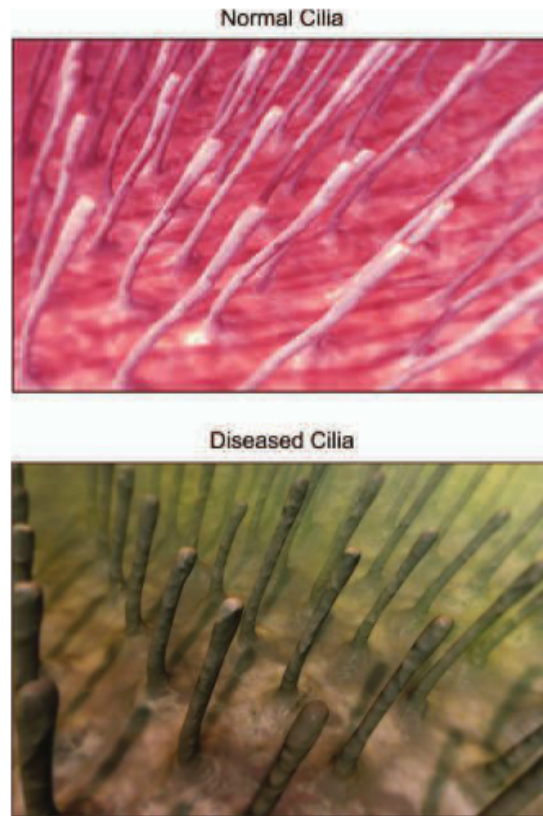
FIGURE 11.4 Probability of death from lung cancer. Data show that quitting smoking at younger ages substantially reduces one's risk of death from lung cancer.

SOURCE: Reprinted by permission from Macmillan Publishers Ltd: Thun, M. J., S. J. Henley, and E. E. Calle. 2002. "Tobacco use and cancer: An epidemiologic perspective for geneticists." *Oncogene* 21(48): 7307–7325.

COPD was the third leading cause of death in the United States in 2008 (the most recent year for which complete data are available). This progressive and disabling disorder consists of several different but related diseases; emphysema and chronic bronchitis are two of the most common.

Cigarette smokers are up to 18 times more likely than nonsmokers to die from emphysema and chronic bronchitis. (Pipe and cigar smokers are more likely to die from COPD than are nonsmokers, but they have a smaller risk than cigarette smokers.) A 2006 study found that one in four heavy smokers develops COPD. The risk rises with the number of cigarettes smoked and falls when smoking ceases. For most Americans, cigarette smoking is a more important cause of COPD than air pollution, but exposure to both is more dangerous than exposure to either by itself.

EMPHYSEMA Smoking is the primary cause of **emphysema**, a disabling condition in which the air sacs in the walls of the lungs lose their elasticity and are gradually destroyed. The lungs' ability to take in oxygen and expel carbon dioxide is impaired. A person with emphysema is often breathless, gasps for air, and has the feeling of drowning. The heart must pump harder and may become enlarged. People with emphysema often die from a damaged heart. There is no known way



Smoking causes damage to the lungs, bronchial tubes and their cilia, and the mouth.

to reverse this disease. In its advanced stage, emphysema leaves the victim bedridden and severely disabled.

CHRONIC BRONCHITIS Persistent, recurrent inflammation of the bronchial tubes characterizes **chronic bronchitis**. When the cell lining of the bronchial tubes is irritated, it secretes excess mucus. Bronchial congestion is followed by a chronic cough, which makes breathing more and more difficult. If smokers have chronic bronchitis, they face a greater risk of lung cancer, no matter how old they are or how many cigarettes they smoke. Chronic bronchitis seems to be a shortcut to lung cancer.

Other Respiratory Damage Even when the smoker shows no signs of lung impairment or disease, cigarette smoking damages the respiratory system. Normally the cells lining the bronchial tubes secrete *mucus*, a sticky fluid that collects particles of soot, dust, and other substances in inhaled air. Mucus is carried up to the mouth by the continuous motion of *cilia*, which are hairlike structures that protrude from the inner surface of the bronchial tubes. If the cilia are

emphysema A disease characterized by a loss of lung tissue elasticity and destruction of the air sacs, impairing the lungs' ability to take in oxygen and expel carbon dioxide.

chronic bronchitis Recurrent, persistent inflammation of the bronchial tubes.

TERMS

destroyed or impaired, or if inhaled air contains more pollutants than the system can remove, the protection provided by cilia is lost.

Cigarette smoke first slows and then stops the action of the cilia. Eventually it destroys them, leaving delicate membranes exposed to injury from substances inhaled in cigarette smoke or from the polluted air in which the person lives or works. Special cells called *macrophages* (a type of white blood cell) also work to remove foreign particles from the respiratory tract by engulfing them. Smoking appears to make macrophages work less efficiently. This interference with the functioning of the respiratory system often leads rapidly to the conditions known as *smoker's throat* and *smoker's cough*, as well as to shortness of breath. Even smokers of high school age show impaired respiratory function compared with nonsmokers of the same age. Other respiratory effects of smoking include a worsening of allergy and asthma symptoms and an increase in the smoker's susceptibility to colds.

Although cigarette smoking can cause many respiratory disorders and diseases, the damage is not always permanent. Once a person stops smoking, steady improvement in overall lung function usually takes place. Chronic coughing subsides, mucus production returns to normal, and breathing becomes easier. The likelihood of lung disease drops sharply. People of all ages, even those who have been smoking for decades, enjoy improved health after they stop smoking.

Additional Health, Cosmetic, and Economic Concerns

- **Ulcers.** People who smoke are more likely to develop peptic ulcers and are more likely to die from them (especially stomach ulcers) because smoking impairs the body's healing ability. Smoking also increases the risk of gastroesophageal reflux, which causes heartburn and can, if severe, raise the risk of esophageal cancer.
- **Erectile dysfunction.** Smoking affects blood flow in the veins and arteries of the penis and is an independent risk factor for erectile dysfunction (impotence). In one recent study, smokers were twice as likely as nonsmokers to experience erectile dysfunction.
- **Reproductive health problems.** Smoking is linked to reduced fertility in both men and women. A study of 18-year-old male smokers found that they had a significantly higher proportion of abnormally shaped sperm and sperm with genetic defects than nonsmokers. In women, smoking can contribute to menstrual disorders, early menopause, and complications of pregnancy.
- **Dental diseases.** Smokers are at increased risk for tooth decay and gum and periodontal diseases, with symptoms appearing by the mid-20s.
- **Diminished physical senses.** Smoking dulls the senses of taste and smell. Over time it increases the risk of hearing

loss and of macular degeneration and cataracts (both are serious eye conditions that can result in partial or total blindness).

- **Injuries.** Smokers have higher rates of motor vehicle crashes, fire-related injuries, and back pain.
- **Cosmetic concerns.** Smoking can cause premature skin wrinkling, premature baldness, stained teeth, discolored fingers, and a persistent tobacco odor in clothes and hair.
- **Economic costs.** In September 2011 the average per-pack price of cigarettes was \$5.29. A pack-a-day habit cost more than \$1900 per year for cigarettes alone.

In addition, smoking contributes to osteoporosis, increases the risk of complications from diabetes, and accelerates the course of multiple sclerosis. Further research may link tobacco use to other disorders.

QUICK STATS

In 2007 the total health care and productivity costs of smoking amounted to \$227 billion.

—American Cancer Society, 2012

Cumulative Effects The cumulative effects of tobacco use fall into two general categories. The first category is reduced life expectancy. A male who takes up smoking before age 15 and continues to smoke is only half as likely to live to age 75 as a male who never smokes. Females who have similar smoking habits also have a reduced life expectancy.

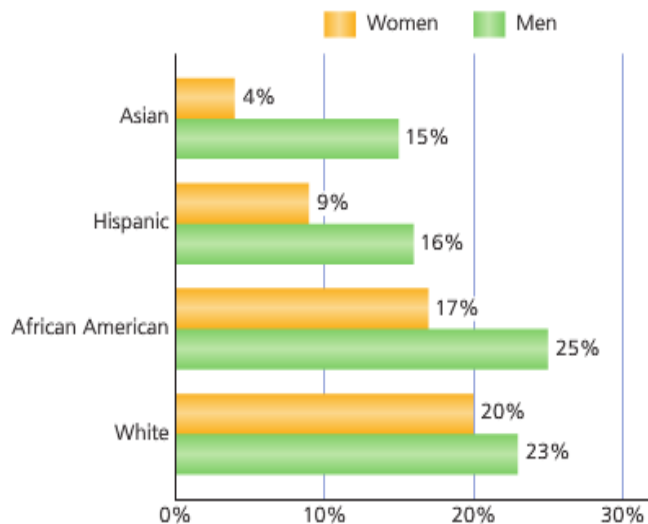
The second category involves quality of life. A national health survey begun in 1964 shows that smokers spend one-third more time away from their jobs because of illness than nonsmokers. Female smokers spend 17% more days sick in bed than female nonsmokers. Lost workdays due to smoking number in the millions.

Both male and female smokers show a greater rate of acute and chronic disease than people who have never smoked. Smokers become disabled at younger ages than nonsmokers and have more years of unhealthy life as well as shorter life spans. The U.S. Public Health Service estimates that if all people had the same rate of disease as those who never smoked, there would be 1 million fewer cases of chronic bronchitis, 1.8 million fewer cases of **sinusitis**, and 1 million fewer cases of peptic ulcers in the country every year.

Gender Differences in Health Hazards As the rate of smoking among women approaches that of men (Figure 11.5), so do rates of tobacco-related illness and death. Although overall risks of tobacco-related illness are similar for women and men, sex appears to make a difference in some diseases. Women, for example, are more at risk for smoking-related blood clots and strokes than are men, and the risk is even greater for women using oral contraceptives. Among men and women with the same smoking history, the odds for developing three major types of cancer, including lung cancer,

sinusitis Inflammation of the sinus cavities; symptoms include headache, fever, and pain.

TERMS



VITAL STATISTICS

FIGURE 11.5 Differences in smoking prevalence between American men and women: United States, 2010.

SOURCE: American Cancer Society, 2012. *Cancer Facts and Figures, 2012*. Atlanta: American Cancer Society.

is 1.2–1.7 times higher in women than in men. More American women now die each year from lung cancer than from breast cancer. Women may also have a greater biological vulnerability to lung cancer.

For both men and women, tobacco use is associated with increased incidence of sex-specific health problems. Men who smoke increase their risk of erectile dysfunction and infertility due to reduced sperm density and motility. Women who smoke have higher rates of osteoporosis (a bone-thinning disease that can lead to fractures), thyroid-related diseases, and depression.

Women who smoke also have risks associated with reproduction and the reproductive organs. Smoking is associated with greater menstrual bleeding, greater duration of painful menstrual cramps, and more variability in menstrual cycle length. Smokers have a more difficult time becoming pregnant, and they reach menopause on average a year or two earlier than nonsmokers. When women smokers become pregnant, they face increased chances of miscarriage or placental disorders that lead to bleeding and premature delivery; rates of ectopic pregnancy, preeclampsia, and stillbirth are also higher among women who smoke. In addition, smoking is a risk factor for cervical cancer.

Other Forms of Tobacco Use

Many smokers have switched from cigarettes to other forms of tobacco, such as spit (smokeless) tobacco, cigars, pipes, clove cigarettes, bidis, and e-cigarettes. These alternatives, however, are far from safe.

Spit (Smokeless) Tobacco More than 8.1 million adults and about 9% of all high school students are current spit

tobacco users, with a higher prevalence of current smokeless tobacco use among male (15.0%) than female (2.2%) students. Spit tobacco use has increased in recent years and is especially common among Native Americans, adolescent males (especially white males), male college athletes, and professional baseball players. About 80% of users start by the ninth grade.

Spit tobacco comes in two major forms: snuff and chewing tobacco (chew). In snuff, the tobacco leaf is processed into a coarse, moist powder and mixed with flavorings. Snuff is usually sold in small tins. Users place a “pinch,” “dip,” or “quid” between the lower lip or cheek and gum and suck on it. In chewing tobacco, the tobacco leaf may be shredded (“leaf”), pressed into bricks or cakes (“plugs”), or dried and twisted into ropelike strands (“twists”). Chew is usually sold in pouches. Users place a wad of tobacco in their mouth and then chew or suck it to release the nicotine. All types of smokeless tobacco cause an increase in saliva production, and the resulting tobacco juice is spit out or swallowed. A recent innovation in smokeless tobacco, called *snus*, comes in a tiny pouch that is placed between the lip and gum. Snus does not require the user to spit as do other forms of smokeless tobacco.

The nicotine in spit tobacco—along with flavorings and additives—is absorbed through the gums and lining of the mouth. Holding an average-size dip in the mouth for 30 minutes delivers about the same amount of nicotine as two or three cigarettes. Because of its nicotine content, spit tobacco is highly addictive. Some users keep it in their mouth even while sleeping.

Although not as dangerous as smoking cigarettes, the use of spit tobacco carries many health risks. Changes can occur in the mouth after only a few weeks of use. Gums and lips become dried and irritated and may bleed. White or red patches may appear inside the mouth; this condition, known as *leukoplakia*, can lead to oral cancer. About 25% of regular spit tobacco users have *gingivitis* (inflammation) and recession of the gums and bone loss around the teeth, especially where the tobacco is usually placed. The senses of taste and



The use of smokeless tobacco can lead to gingivitis, which causes swollen, discolored, and bleeding gums.

smell are usually dulled. In addition, other people are repelled by the presence of wads of tobacco in the mouth, stained teeth, bad breath, and behaviors such as frequent spitting.

One of the most serious effects of spit tobacco is an increased risk of oral cancer—cancers of the lip, tongue, cheek, throat, gums, roof and floor of the mouth, and larynx. Spit tobacco contains at least 28 chemicals known to cause cancer, and long-term snuff use may increase the risk of oral cancer by as much as 50 times. Surgery to treat oral cancer is often disfiguring and may involve removing parts of the face, tongue, cheek, or lip.

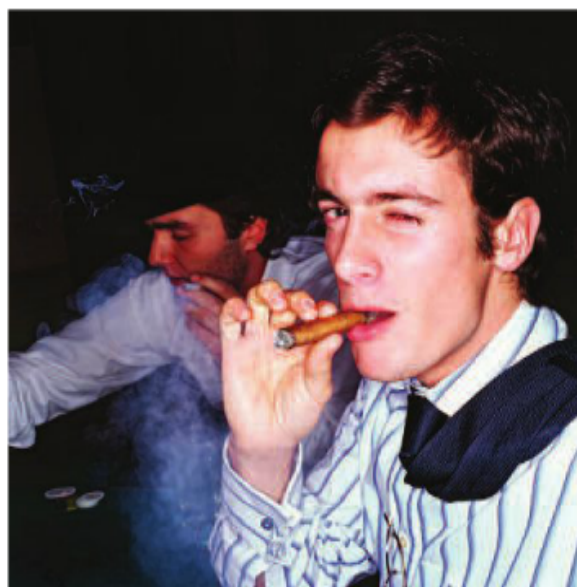
Dipping and chewing tobacco produce blood levels of nicotine similar to those in cigarette smokers. Other chemicals in spit tobacco are believed to pose risks to developing fetuses.

Cigars and Pipes After decades of decline, cigar smoking has increased steadily since the early 1990s. Cigars are most popular among white males aged 18–44 with higher-than-average income and education, but women are also smoking cigars in record numbers. Cigar use is also growing among young people: in government surveys, 14% of American high school students reported having smoked at least one cigar in the previous month. Fewer than 1% of Americans, mostly males who also smoke cigarettes, are pipe smokers.

Cigars are made from rolled whole tobacco leaves; pipe tobacco is made from shredded leaves and is often flavored. Because cigar and pipe smoke is more alkaline than cigarette smoke, users of cigars and pipes do not need to inhale in order to ingest nicotine; instead they absorb nicotine through the gums and lining of the mouth. Cigars contain more tobacco than cigarettes and so contain more nicotine and produce more tar when smoked. Large cigars may contain as much tobacco as a whole pack of cigarettes and take one or two hours to smoke.

The smoke from cigars contains many of the same toxins and carcinogens as the smoke from cigarettes, some in much higher quantities. The health risks of cigars depend on the number of cigars smoked and whether the smoker inhales. Because most cigar and pipe users do not inhale, they have a lower risk of cancer and cardiovascular and respiratory diseases than cigarette smokers. However, their risks are substantially higher than those of nonsmokers. For example, compared to nonsmokers, people who smoke one or two cigars per day without inhaling have 6 times the risk of cancer of the larynx. The risks are much higher for cigar smokers who inhale: they have 27 times the risk of oral cancer and 53 times the risk of cancer of the larynx compared to nonsmokers, and their risk of heart and lung diseases approaches that of cigarette smokers. Smoking a cigar immediately impairs the ability of blood vessels to dilate, reducing the amount of oxygen delivered to tissues, including the heart muscle, especially during stress. Pipe and cigar smoking are also risk factors for pancreatic cancer, which is almost always fatal.

Nicotine addiction is another concern. Most adults who smoke cigars do so only occasionally, and there is little



Occasional cigar smoking may be more likely to lead to nicotine addiction in teens than in adults.

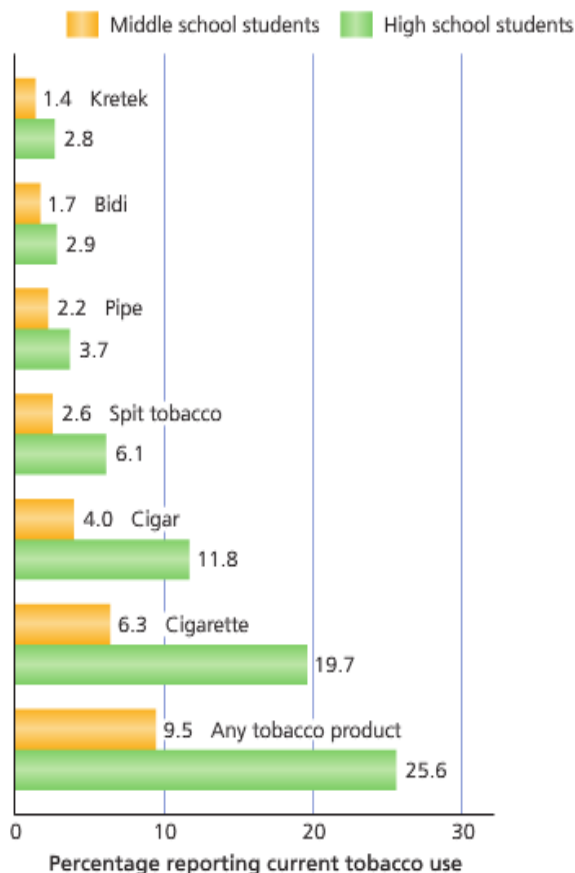
evidence that use of cigars by adults leads to addiction. The recent rise in cigar use among teens has raised concerns, however, because nicotine addiction almost always develops in the teen or young adult years. More research is needed to determine if cigar use by teens will develop into nicotine addiction and frequent use of either cigarettes or spit tobacco.

A large cigar may contain as much tobacco as a whole pack of cigarettes.

Clove Cigarettes and Bidis Clove cigarettes, also called “kreteks” or “chicartas,” are made of tobacco mixed with chopped cloves; they are imported primarily from Indonesia and Pakistan. Clove cigarettes contain almost twice as much tar, nicotine, and carbon monoxide as conventional cigarettes and so present all the same health hazards. Some chemical constituents of cloves may also be dangerous. For example, eugenol, an anesthetic compound found in cloves, may impair the respiratory system’s ability to detect and defend against foreign particles. There have been a number of serious respiratory injuries and deaths from the use of clove cigarettes.

Bidis, or “beadies,” are small cigarettes imported from India that contain species of tobacco different from those used by U.S. cigarette manufacturers. The tobacco in bidis is hand-rolled in Indian ebony leaves (tendu) and then often flavored; clove, mint, chocolate, and fruit varieties are available. Bidis contain up to four times more nicotine than and twice as much tar as U.S. cigarettes. Use of bidis has been growing among teens, possibly because of the flavorings they contain or because they look and smell somewhat like marijuana cigarettes (joints); they do not produce the same psychoactive effects as marijuana, however.

Currently an estimated 3% of high school students use clove cigarettes or bidis (Figure 11.6). Neither is a safe or healthy alternative to conventional tobacco cigarettes.



VITAL STATISTICS

FIGURE 11.6 Tobacco use among middle school and high school students.

SOURCE: Centers for Disease Control and Prevention. 2007. *2006 National Youth Tobacco Survey and Key Prevalence Indicators*. Atlanta: Centers for Disease Control and Prevention.

E-Cigarettes The electronic cigarette, also known as an *e-cig*, is a battery-powered device that resembles a real cigarette. Instead of containing tobacco, the device uses a changeable filter that contains one or more chemicals, such as nicotine, flavorings, and other compounds. The user “smokes” an *e-cig* by sucking the filtered end; the device’s battery heats the chemicals to create an inhalable vapor. During use, the device’s tip even glows like the burning end of a real cigarette.

Although electronic cigarettes have been advertised as a way to help smokers quit smoking, there has been no evi-

dence submitted to the Food and Drug Administration (FDA) supporting this claim. In fact, according to a new analysis by the FDA, the vapor from electronic cigarettes contain carcinogens and other toxic chemicals, such as diethylene glycol, which is a toxic chemical found in antifreeze.

Marketers of *e-cigs* have claimed that the devices deliver only nicotine, making them a safe cigarette that does not cause cancer and can serve as an alternative to other nicotine replacement products such as gum and patches. According to the FDA, however, not all *e-cigs* actually contain nicotine. Further, the FDA has warned consumers not to purchase or use *e-cigs* because analysis of nearly 20 *e-cig* cartridges revealed that they contained carcinogens, including at least one of the same carcinogens found in real cigarettes.

In issuing its warning, the FDA noted that some varieties of *e-cigs* are flavored, apparently to make them appeal to youngsters and other first-time smokers. The products do not carry the same types of warnings required on tobacco products.

THE EFFECTS OF SMOKING ON THE NONSMOKER

Tobacco users aren’t the only ones who suffer ill effects from their habits. Tens of thousands of nonsmokers die each year because of exposure to secondhand smoke. Further, the medical and societal costs of tobacco use are enormous.

Environmental Tobacco Smoke

The U.S. Environmental Protection Agency (EPA) has designated **environmental tobacco smoke (ETS)**—more commonly called *secondhand smoke*—a Class A carcinogen. The Department of Health and Human Services’ National Toxicology Program classifies ETS as a “known human carcinogen.” These designations put ETS in the same category as notorious cancer-causing agents like asbestos. The Surgeon General has concluded that there is no safe level of exposure to ETS; even brief exposure can cause serious harm.

Environmental tobacco smoke consists of mainstream smoke and sidestream smoke. Smoke exhaled by smokers is referred to as **mainstream smoke**. Sidestream smoke enters the atmosphere from the burning end of a cigarette, cigar, or pipe. Nearly 85% of the smoke in a room where someone is smoking comes from sidestream smoke. Undiluted sidestream smoke, because it is not filtered through either a cigarette filter or a smoker’s lungs, has twice as much tar and nicotine, three

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know anyone who has suffered from an illness related to tobacco use? If so, what problems did that person face? What was the outcome? Did the experience have any effect on your views about using tobacco?



environmental tobacco smoke (ETS) Smoke that enters the atmosphere from the burning end of a cigarette, cigar, or pipe, as well as smoke that is exhaled by smokers; also called *secondhand smoke*.

mainstream smoke Smoke that is inhaled by a smoker and then exhaled into the atmosphere.

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TAKE CHARGE

Avoiding ETS

Given the health risks of exposure to ETS, try these strategies to keep the air around you safe:

- **Speak up tactfully.** Smokers may not know the dangers they are causing or may not know it bothers you.
- **Display reminders.** Put up signs asking smokers to refrain in your home, work area, and car.
- **Don't allow smoking in your home or room.** Get rid of ashtrays and ask smokers to light up outside.

- **Open a window.** If you cannot avoid being in a room with a smoker, at least try to provide some ventilation.

- **Sit in the nonsmoking section in restaurants and other public areas.** Complain to the manager if none exists.

- **Fight for a smoke-free work environment.** Join with your coworkers to either eliminate all smoking indoors or confine it to certain areas.

- **Discuss quitting strategies.** Social pressure is a major factor in many former smokers' decisions to quit. Help the smokers in your life by sharing quitting strategies with them.

times as much benzo(a)pyrene, almost three times as much carbon monoxide, and three times as much ammonia.

In rooms where people are smoking, levels of carbon monoxide can exceed those permitted by Federal Air Quality Standards for outside air. In a typical home with the windows closed, it takes about six hours for 95% of the airborne cigarette smoke particles to clear. The carcinogens in the secondhand smoke from a single cigar exceed those of three cigarettes, and cigar smoke contains up to 30 times more carbon monoxide.

The CDC estimates that 88 million nonsmoking Americans (including 54% of children aged 3–11 years) are exposed to some level of ETS every year.

ETS Effects Nonsmokers subjected to ETS frequently develop coughs, headaches, nasal discomfort, and eye irritation. Other symptoms range from breathlessness to sinus problems. People with allergies tend to suffer the most (see the box "Avoiding ETS").

ETS causes 3400 lung cancer deaths and about 46,000 deaths from heart disease each year in people who do not smoke—that's an increased risk of up to 30% for getting lung cancer and heart disease. Exposure to ETS is also associated with a 20% increase in the progression of atherosclerosis. ETS aggravates asthma and increases the risk for breast and cervical cancers.

Scientists have been able to measure changes that contribute to lung tissue damage and potential tumor promotion in the bloodstreams of healthy young test subjects who spend just three hours in a smoke-filled room. After just 30 minutes of exposure to ETS, the function in the coronary arteries of healthy nonsmokers is reduced to the same level as that of smokers. And nonsmokers can still be affected by the harmful effects of ETS hours after they have left a smoky environment.

According to the U.S. Surgeon General, there is no safe level of exposure to secondhand smoke.

Carbon monoxide, for example, lingers in the bloodstream five hours after exposure.

Infants, Children, and ETS Recent studies have shown that infants exposed to smoke from more than 21 cigarettes a day are more than 23 times more likely to die of sudden infant death syndrome (SIDS) than are babies not exposed to ETS. The National Cancer Institute recently estimated that ETS causes up to 18,600 cases of low birth weight each year. Children under age 5 whose primary caregiver smokes 10 or more cigarettes per day have measurable blood levels of nicotine and tobacco carcinogens. Chemicals in tobacco smoke also show up in breast milk, and breastfeeding may pass more chemicals to the infant of a smoking mother than direct exposure to ETS.

ETS triggers bronchitis, pneumonia, and other respiratory infections in infants and toddlers up to age 18 months, resulting in as many as 15,000 hospitalizations each year.

Older children suffer, too. ETS is a risk factor for asthma and aggravates the symptoms of children who already have asthma. ETS is also linked to reduced lung function and fluid buildup in the middle ear, a contributing factor in middle-ear infections, a leading reason for childhood surgery. Children and teens exposed to ETS score lower on tests of reading and reasoning. Later in life, people exposed to ETS as children are at increased risk for lung cancer, emphysema, and chronic bronchitis.

Smoking and Pregnancy

Smoking almost doubles a pregnant woman's chance of having a miscarriage, and it significantly increases her risk of ectopic pregnancy. Maternal smoking causes hundreds of infant deaths in the United States each year, primarily due to



Millions of American infants and children are regularly exposed to environmental tobacco smoke.

premature delivery and smoking-related problems with the placenta. Maternal smoking is a major factor in low birth weight, which puts newborns at high risk for infections and other serious problems. If a nonsmoking mother is regularly exposed to ETS, her infant is also at greater risk for low birth weight. Recent studies have also shown that babies whose mothers smoked during pregnancy have higher rates of colic, clubfoot, cleft lip and palate, and impaired lung function; they may also have other genetic damage.

Babies born to mothers who smoke more than two packs a day perform poorly on developmental tests in the first hours after birth, compared to babies of nonsmoking mothers. Later in life, obesity, hyperactivity, short attention span, and lower scores on spelling and reading tests all occur more frequently in children whose mothers smoked during pregnancy than in those born to nonsmoking mothers. Prenatal tobacco exposure has also been associated with behavioral problems in children, including immaturity, emotional instability, physical aggression, and hyperactivity. Other research shows that teenagers whose mothers smoked during pregnancy have lower scores on tests of general intelligence and poorer performance on tasks requiring auditory memory than do children who were not exposed to cigarette smoke before birth. Males born

to smoking mothers have higher rates of adolescent and adult criminal activity, suggesting that maternal smoking may cause brain damage that increases the risk of criminal behavior. Nevertheless, 16.4% of pregnant women smoke.

The Cost of Tobacco Use to Society

The annual health care expenditures related to smoking exceed \$99 billion, and the annual cost of lost productivity is nearly \$97 billion. These costs far exceed the tax revenues that states collect on the sale of tobacco products, even though the average cigarette tax was \$1.45 per pack as of June 2010 and is rising in some states.

WHAT CAN BE DONE?

There are many ways to act against this public health threat.

Action at the Local Level

Since the 1980s local government agencies—such as city councils, school boards, and county boards of commissioners—have been passing ordinances designed to discourage smoking in public places. There are now thousands of local ordinances across the nation that restrict or ban smoking in restaurants, stores, workplaces, and even public outdoor areas. An assessment made in 2010 found that nearly 80% of Americans live in municipalities that restrict or ban smoking in public buildings, workplaces, restaurants, and bars. Hundreds of colleges and universities now have totally smoke-free campuses or prohibit smoking in residential buildings. As local nonsmoking laws proliferate, evidence mounts that environmental restrictions are effective in encouraging smokers to quit.

Action at the State and Federal Levels

State legislatures have passed many tough new anti-tobacco laws. As of January 2012, comprehensive smoke-free air laws were in effect in 35 states, the District of Columbia, and Puerto Rico. These laws prohibit smoking in almost all public areas, as well as in workplaces, restaurants, and bars. As of December 2011, 29 states and the District of Columbia had cigarette tax rates of at least \$1.00 per pack; in 14 of those states, the tax rate was \$2.00 or more per pack. At that time New York's cigarette tax was \$4.35 per pack—the nation's highest.

California has one of the most aggressive—and successful—tobacco control programs, combining taxes on cigarettes, graphic advertisements, and bans on smoking in bars and restaurants. California now has the second-lowest rate of smoking among U.S. states, at 12.1%. Utah, with a smoking rate of 9.1%, is the first (and only) state to meet the *Healthy People 2010* target. West Virginia has the highest rate: 26.8%.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your views on the government's role in regulating tobacco products? Is there currently enough regulation, or should the government go further in controlling the production and marketing of these products? What events or experiences have shaped your views on this issue?



In many public spaces, such as airports, smokers can light up only in designated smoking areas. These designated zones are often outdoors, but some facilities have enclosed spaces with special ventilation to prevent smoke from escaping.

FDA Regulation of Tobacco

Tobacco products—all of which are somehow ingested, contain psychoactive drugs, and include many of the same additives used in food products—have historically not been regulated by the U.S. Food and Drug Administration (FDA). But that changed in 2009 when Congress gave the FDA broad regulatory powers over the production, marketing, and sale of tobacco products.

Although the Family Smoking Prevention and Tobacco Control Act does not empower the FDA to ban nicotine outright (Congress retains that power), the agency can dictate how much nicotine is included in tobacco products. The law gives the FDA the power to eliminate or control levels of the thousands of chemical additives used to make tobacco more appealing and addictive. In addition, the legislation strengthens health warnings and places even greater limits on tobacco advertising.

Specifically, the 2009 law allows the FDA to do the following:

- Enforce tougher rules on the marketing and sales of tobacco products, especially to minors. For example, the FDA can ban tobacco brands from sponsoring sports and entertainment events.
- Make it more difficult for minors to purchase tobacco by requiring retailers to display such products behind the counter in stores. The agency also has the authority to strengthen enforcement and raise penalties to discourage the sale of tobacco products to minors.
- Ban the use of terms such as “light,” “mild,” or “low” in product advertising and packaging.

- Require bigger, more informative health warnings on tobacco products. The warnings mark the first change in cigarette warnings in more than 25 years and are a significant advancement in communicating the dangers of smoking.
- Require manufacturers to provide detailed disclosure of their products’ ingredients. The disclosures must include nicotine levels, specific additives used, and harmful components in the products’ smoke.
- Create a content standard that tobacco products must meet. If needed, the FDA can require manufacturers to modify products to meet the standard.
- Ban all cigarette flavorings, with the exception of menthol.
- Regulate so-called “reduced harm” products. In order to market or sell a product as

being less harmful than others, the manufacturer must provide proof of the claim and receive special FDA permission.

- Establish a minimum age of 18 for the purchase of tobacco products.
- Prohibit manufacturers from giving away free samples of cigarettes and restrict the giving away of smokeless products.
- Fund regulatory activity through a user fee on tobacco products, to be collected from manufacturers.
- Protect states’ ability to pass other tobacco control laws.
- Regulate electronic cigarette products with the same restrictions as other tobacco products.

The FDA began implementing many of its new powers upon the law’s passage in June 2009. The full regulatory powers and new regulations took effect in June 2010.

International Action

Many countries are following the United States’ lead in restricting smoking. Smoking is now banned on many international air flights, as well as in many restaurants and hotels and on public transportation in some countries. The World Health Organization has taken the lead in international anti-tobacco efforts by sponsoring the Framework Convention on Tobacco Control. Another international activity is the annual commemoration of World No Tobacco Day (May 31), on which smokers are encouraged to stop smoking for one day. (This is similar to the American Cancer

Society's Great American Smokeout®, held each November.) The smoker who successfully takes the first step of quitting for a day may be encouraged enough to follow through on the commitment and become a permanent nonsmoker. With more than 1 billion smokers worldwide, addressing the global impact of tobacco use requires a massive coordinated effort.

Action in the Private Sector

The number of smoke-free restaurants has increased dramatically in recent years, and the vast majority of the nation's shopping malls now prohibit smoking.

Such local, state, national, and international efforts represent progress, but health activists warn that tobacco industry influence remains strong. The tobacco industry contributes heavily to sympathetic legislative officeholders and candidates. Many states have relatively weak anti-smoking laws that are backed by the tobacco industry and include clauses that prevent the passage of stricter local ordinances. Since 1999 tobacco interests have spent more than \$115 million on federal lobbying activities. During the 2007–2008 election cycle, the industry gave \$2 million directly to federal candidates.

QUICK STATS

Smoking-related health costs amount to \$10.47 per pack of cigarettes consumed by Americans.

—CDC, 2011

Individual Action

Nonsmokers have the right not only to breathe clean air but also to take action to help solve one of society's most serious public health threats. Here are just some of the many ways in which individuals can help support tobacco prevention and stop-smoking efforts.

- When a smoker violates a no-smoking designation, complain.
- If your favorite restaurant or shop doesn't have a non-smoking policy, ask the manager to adopt one.
- If you see children buying tobacco, report this illegal activity to the facility manager or the police.
- Learn more about addiction and tobacco cessation so you can better support the tobacco users you know.
- Vote for candidates who support anti-tobacco measures; contact local, state, and national representatives to express your views.
- Cancel your subscriptions to magazines that carry tobacco advertising; send a letter to the publisher explaining your decision.
- Voice your opinion about other positive representations of tobacco use. (A recent study found that more than two-thirds of children's animated feature films have featured tobacco or alcohol use with no clear message that such practices were unhealthy.)

- Volunteer with the American Lung Association, the American Cancer Society, or the American Heart Association.

HOW A TOBACCO USER CAN QUIT

Giving up tobacco is a long-term, intricate process. Heavy smokers who say they simply stopped “cold turkey” don't tell of the struggle and mental processes that contributed to their final conquest over this powerful addiction.

Research shows that tobacco users move through predictable stages—from being uninterested in stopping, to thinking about change, to making a serious effort to stop, to finally maintaining abstinence. But most attempt to quit several times before they finally succeed. Relapse is a normal part of the process.

The Benefits of Quitting

Giving up tobacco provides immediate health benefits to men and women of all ages (Table 11.2). People who quit smoking find that food tastes better. Their sense of smell is sharper. Circulation improves, heart rate and blood pressure drop, and lung function and heart efficiency increase. Ex-smokers can breathe more easily, and their capacity

for exercise improves. Many ex-smokers report feeling more energetic and alert. They experience fewer headaches. Even their complexions may improve.

Quitting also has a positive effect on long-term disease risk. From the first day without tobacco, ex-smokers begin to decrease their risk of cancer of the lung, larynx, mouth, pancreas, bladder, cervix, and other sites. Risk of heart attack, stroke, and other cardiovascular diseases drops quickly, too.

The younger people are when they stop smoking, the more pronounced the health improvements. And these improvements gradually but invariably increase as the period of non-smoking lengthens. It's never too late to quit, though. According to a U.S. Surgeon General's report, people who quit smoking, regardless of age, live longer than people who continue to smoke. Even smokers who have already developed chronic bronchitis or emphysema may show some improvement when they quit.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What anti-smoking ordinances are in effect in your community? Does your school prohibit smoking on campus? Do you think these rules have been effective in reducing smoking or exposure to ETS? Do you support such regulations? Why or why not?

Table 11.2 Benefits of Quitting Smoking

Within 20 minutes of your last cigarette:

- You stop polluting the air
- Blood pressure drops to normal
- Pulse rate drops to normal
- Temperature of hands and feet increases to normal

8 hours:

- Carbon monoxide level in blood drops to normal
- Oxygen level in blood increases to normal

24 hours:

- Chance of heart attack decreases

48 hours:

- Nerve endings start regrowing
- Ability to smell and taste is enhanced

2–3 months:

- Circulation improves
- Walking becomes easier
- Lung function increases up to 30%

1–9 months:

- Coughing, sinus congestion, fatigue, and shortness of breath all decrease

1 year:

- Heart disease death rate is half that of a smoker

5 years:

- Stroke risk drops nearly to the risk for nonsmokers

10 years:

- Lung cancer death rate drops to 50% of that of continuing smokers
- Incidence of other cancers (mouth, throat, larynx, esophagus, bladder, kidney, and pancreas) decreases
- Risk of ulcer decreases

15 years:

- Risk of lung cancer is about 25% of that of continuing smokers
- Risks of heart disease and death are close to those of nonsmokers

Behavior Change Choosing to quit requires developing a strategy for success (see the box “Building Motivation to Quit Smoking”). Some people quit cold turkey, whereas others taper off slowly. There are over-the-counter and prescription products that help many people. Behavioral factors that have been shown to increase the chances of a smoker’s permanent smoking cessation are support from others and regular exercise. Support can come from friends and family and/or formal group programs sponsored by organizations such as the American Cancer Society and the American Lung Association, or by your college health center or community hospital. Programs that combine group support with nicotine replacement therapy have rates of continued abstinence as high as 35% after one year.

Most smokers in the process of quitting experience both physical and psychological effects of nicotine withdrawal, and exercise can help with both. For many smokers, tobacco use is associated with certain times and places—following a meal, for example. Resolving to walk after dinner instead of lighting up provides a distraction from cravings and eliminates the cues that trigger a desire to smoke. In addition, many people worry about weight gain associated with quitting. Although most ex-smokers do gain a few pounds, at least temporarily, incorporating exercise into a new tobacco-free routine lays the foundation for healthy weight management. The health risks of adding a few pounds are minimal compared to the risks of continued smoking. It’s estimated that a smoker would have to gain 75–100 pounds to equal the health risks of smoking a pack a day.

Telephone Quitlines Free telephone quitlines are emerging as a popular and effective strategy to help stop smoking. Quitlines are staffed by trained counselors who help each caller plan a personal quitting strategy, usually including a combination of nicotine replacement therapy, changes in daily habits, and emotional support. Counselors provide printed materials that match the smoker’s needs and schedule phone counseling sessions for key days after a smoker quits. Smokers can schedule sessions to fit their schedule, and some quitlines may provide stop-smoking medications at reduced prices. Almost all smokers make more than one attempt to stop before they succeed in quitting for good; quitline counselors can help smokers understand what leads to relapse, review their reasons for wanting to quit, and make a better plan for the next attempt. The goal is for smokers to find a support system and techniques that work for them.

The Department of Health and Human Services has a national toll-free number, 1-800-QUITNOW (1-800-784-8669), to serve as a single access point for smokers seeking information and assistance in quitting. Callers are routed to their state’s smoking cessation quitline or, in states that have not established quitlines, to one maintained by the National Cancer Institute.

Options for Quitting

Most tobacco users—76% in a recent survey—want to quit, and half of those who want to quit will make an attempt this year. What are their options? No single method works for everyone, but each does work for some people some of the time. In June 2000 the U.S. Public Health Service issued guidelines for medical professionals on how to help their patients quit smoking, emphasizing the benefits of both behavioral and pharmacological interventions. In 2008 the agency updated those guidelines and urged all physicians to provide anti-smoking intervention and treatment to all their patients who use tobacco. In essence, the health service set a goal of treating every American smoker—not just those who ask their doctors for help in quitting smoking.

It’s never too late to stop smoking, and smokers have a variety of options for quitting.

EMBRACING WELLNESS

Building Motivation to Quit Smoking



A common misconception among smokers is that a few cigarettes a day aren't enough to cause harm. Perhaps this is why a recent survey showed that among college students who smoke, 75% smoke 10 or fewer cigarettes a day. These smokers are ignoring the very real health risks of even one cigarette. The U.S. Public Health Service suggests a "5 R's" strategy to enhance motivation to quit. If you are a smoker or are trying to help one, think about these areas of concern and see if they help develop a desire and readiness to make a real attempt at quitting.

- **Relevance.** Think about the personal relevance of quitting tobacco use. What would the effects be on your family and friends? How would your daily life improve? What is the most important way that quitting would change your life?
- **Risks.** There are immediate risks, such as shortness of breath, infertility, and impotence, and long-term risks, including cancer, heart disease, and respiratory problems. Remember, smoking is harmful both to you and to anyone exposed to your smoke.

- **Rewards.** The list of the rewards of quitting is almost endless, including improving immediate and long-term health, saving money, and feeling better about yourself. You can also stop worrying about quitting and set a good example for others.

- **Roadblocks.** What are the potential obstacles to quitting? Are you worried about withdrawal symptoms, weight gain, or lack of support? How can these barriers be overcome?

- **Repetition.** Revisit your reasons for quitting and strengthen your resolve until you are ready to prepare a plan. Most people make several attempts to quit before they succeed. Relapsing once does not mean that you will never succeed.

SOURCES: Rigotti, N. A., J. E. Lee, and H. Wechsler. 2000. U.S. college students' use of tobacco products. *Journal of the American Medical Association* 284(6): 699–705; Flore, M. C., et al. 2000. *Treating Tobacco Use and Dependence*. Clinical Practice Guidelines. Rockville, MD: U.S. Department of Health and Human Services.

As with any significant change in health-related behavior, giving up tobacco requires planning, sustained effort, and support. It is an ongoing process, not a one-time event. The "Behavior Change Strategy" section describes the steps that successful quitters follow.

Smoking Cessation Products Each year millions of Americans visit their doctors in the hope of finding a drug that can help them stop smoking. Although pharmacological options are limited, the few available drugs have proved successful.

CHANTIX (VARINICLINE) The newest smoking cessation drug, marketed under the name Chantix, works in two ways: it reduces nicotine cravings, easing the withdrawal process, and it blocks the pleasant effects of nicotine. The drug acts on neurotransmitter receptors in the brain.

Six clinical trials, which included more than 3600 long-term, chronic smokers, demonstrated that Chantix is an effective smoking cessation aid. In one of the studies, nearly 25% of Chantix users stopped smoking for a full year. Results varied with the dosage and duration of treatment.

Unlike most smoking cessation products currently on the market, Chantix is not a nicotine replacement. For this reason, smokers may be advised to continue smoking for the first few days of treatment to avoid withdrawal and to allow the drug to build up in their bodies. The approved course of treatment is 12 weeks, but the duration and recommended dosage depend

on several factors, including the smoker's general health and the length and severity of his or her nicotine addiction.

Side effects reported with Chantix include nausea, headaches, vomiting, sleep disruptions, and changes in taste perception. People with kidney problems or who take certain medications should not take Chantix, and it is not recommended for women who are pregnant or nursing. In 2008 the FDA issued a public health advisory warning that some Chantix users suffered adverse reactions, such as behavioral changes, agitation, depression, suicidal thoughts, and attempted suicide.

Anyone taking Chantix should immediately notify his or her doctor of any sudden change in mood or behavior.

ZYBAN (BUPROPION) Bupropion is an antidepressant (prescribed under the name Wellbutrin) as well as a smoking cessation aid (prescribed under the name Zyban). As a smoking cessation aid, bupropion eases the symptoms of nicotine withdrawal and

reduces the urge to smoke. Like Chantix, it acts on neurotransmitter receptors in the brain.

Bupropion is not a nicotine replacement, so the user may need to continue smoking for the first few days of treatment. A nicotine replacement product, such as a patch or gum, may be recommended to further ease withdrawal symptoms after the user stops smoking.

Bupropion users have reported an array of side effects, but they are rare. Side effects may be reduced by changing the dosage, taking the medicine at a different time of day, or taking it

QUICK STATS

67% of American college students report that they have never smoked a cigarette.

—ACHA-NCHA, 2011

with or without food. Bupropion is not recommended for people with specific physical conditions or who take certain drugs. Zyban and Wellbutrin should not be taken together.

NICOTINE REPLACEMENT PRODUCTS The most widely used smoking cessation products replace the nicotine that the user would normally get from tobacco. The user continues to get nicotine, so withdrawal symptoms and cravings are reduced. Although still harmful, nicotine replacement products provide a cleaner form of nicotine without the thousands of poisons and tars produced by burning tobacco. Less of the product is used over time as the need for nicotine decreases.

Nicotine replacement products come in several forms, including patches, gum, lozenges, nasal sprays, and inhalers. They are available in a variety of strengths and can be worked into many different smoking cessation strategies. Most are available without a prescription.

The nicotine patch is popular because it can be applied and forgotten until it needs to be removed or changed, usually every 16 or 24 hours. Placed on the upper arm or torso, it releases a steady stream of nicotine, which is absorbed through the skin. The main side effects are skin irritation and redness. Nicotine gum and nicotine lozenges have the advantage of allowing the smoker to use them whenever he or she craves nicotine. Side effects of nicotine gum include mouth sores and headaches; nicotine lozenges can cause nausea and heartburn. Nicotine nasal sprays and inhalers are available only by prescription.

Although all these products have proved to be effective in helping users stop smoking, experts recommend them only as one part of a complete smoking cessation program. Such a program should include regular professional counseling and physician monitoring.

connect™

Connect to Your Choices

Have you ever thought about where you get your views on smoking and tobacco use? Many factors can influence our views on tobacco, some not as obvious as others. Were your parents smokers, and did their choices influence your decision to smoke or not to smoke? Do you have friends or classmates who smoke? Is your desire to use tobacco affected when movie characters who smoke are portrayed as attractive, desirable, or cool? Do you live in a state where the tobacco industry is strong and smoking is socially acceptable, or do you live where there are strict regulations on smoking?

What are the external factors that influence your choices about tobacco use? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE



For most smokers, quitting is one of the hardest things they'll ever do.

RIGHT NOW YOU CAN:

- If you smoke, throw the pack and matches away.
- If you smoke, think about the next time you'll want a cigarette, such as while talking on the phone this afternoon or relaxing after dinner tonight. Visualize yourself enjoying this activity without smoking.
- If you use tobacco, go outside for a short walk or a stretch to limber up. Breathe deeply. Tell a friend you've just decided to quit.

IN THE FUTURE YOU CAN:

- Resolve to talk to someone you know who uses tobacco, offering support and assistance if the person is interested in quitting.
- If you smoke, resolve to quit. Research your options for quitting and choose the one you think will work best for you.
- Recruit a friend or family member to help you quit smoking. Arrange to talk to this person whenever you feel the urge to smoke.

SUMMARY

- Smoking is the largest preventable cause of ill health and death in the United States. Nevertheless, millions of Americans use tobacco.
- Regular tobacco use causes physical dependence on nicotine, characterized by loss of control, tolerance, and withdrawal. Habits can become associated with tobacco use and trigger the urge for a cigarette.
- People who begin smoking are usually imitating others or responding to seductive advertising. Smoking is associated with low education level and the use of other drugs.
- Tobacco smoke is made up of hundreds of different chemicals, including some that are carcinogenic or poisonous or that damage the respiratory system.
- Nicotine acts on the nervous system as a stimulant or a depressant. It can cause blood pressure and heart rate to increase, straining the heart.
- Cardiovascular disease is the most widespread cause of death for cigarette smokers. Cigarette smoking is the primary cause of lung cancer and is linked to many other cancers and respiratory diseases.
- Cigarette smoking is linked to ulcers, impotence, reproductive health problems, dental diseases, and other conditions. Tobacco use leads to lower life expectancy and to a diminished quality of life.
- The use of spit tobacco leads to nicotine addiction and is linked to a variety of cancers of the head and neck.

- Cigars, pipes, clove cigarettes, and bidis are not safe alternatives to cigarettes.
- Environmental tobacco smoke (ETS) contains high concentrations of toxic chemicals and can cause headaches, eye and nasal irritation, and sinus problems. Long-term exposure to ETS causes cancer and heart disease.
- Infants and young children take in more pollutants than adults do; children whose parents smoke are especially susceptible to respiratory diseases.
- Smoking during pregnancy increases the risk of miscarriage, stillbirth, congenital abnormalities, premature birth, and low birth weight. SIDS, behavior problems, and long-term impairments in development are also risks.
- The overall cost of tobacco use to society includes the cost of both medical care and lost worker productivity.
- There are many avenues individuals and groups can take to act against tobacco use. Nonsmokers can use social pressure and legislative channels to assert their rights to breathe clean air.
- Giving up smoking is a difficult and long-term process. Although most ex-smokers quit on their own, some smokers benefit from stop-smoking programs, OTC and prescription medications, and support groups.

FOR MORE INFORMATION

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Vaknin, J. 2007. *Smoke Signals: 100 Years of Tobacco Advertising*. London: Middlesex University Press. An exploration of the many ways tobacco products have been marketed to consumers.

ORGANIZATIONS, HOTLINES, AND WEBSITES

Action on Smoking and Health (ASH). An advocacy group that provides statistics, news briefs, and other information.

<http://ash.org>

American Cancer Society (ACS). Sponsor of the annual Great American Smokeout; provides information about the dangers of tobacco, as well as tools for prevention and cessation for both smokers and users of spit tobacco.

<http://www.cancer.org>

American Lung Association. Provides information about lung diseases, tobacco control, and environmental health.

<http://www.lungusa.org>

CDC's Tobacco Information and Prevention Source (TIPS). Provides research results, educational materials, and tips on how to quit smoking; website includes special sections for kids and teens.

<http://www.cdc.gov/tobacco>

Environmental Protection Agency Indoor Air Quality/ETS. Provides information and links about secondhand smoke.

<http://www.epa.gov/smokefree>

Nicotine Anonymous. A 12-step program for tobacco users.

<http://www.nicotine-anonymous.org>

Smokefree.Gov. Provides step-by-step strategies for quitting as well as expert support via telephone or instant messaging.

<http://www.smokefree.gov>

Tobacco BBS. A resource center on tobacco and smoking issues that includes news and information, assistance for smokers who want to quit, and links to related sites.

<http://www.tobacco.org>

World Health Organization Tobacco Free Initiative. Promotes the goal of a tobacco-free world.

<http://www.who.int/tobacco/en>

World No Tobacco Day (WNTD). Provides information about the annual worldwide event to encourage people to quit smoking; includes general information about tobacco use and testimonials of ex-smokers.

<http://www.who.int/tobacco/wntd/2012/announcement/en/index.html>

See also the listings for Chapters 9, 15, and 16.

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BEHAVIOR CHANGE STRATEGY

Kicking the Tobacco Habit

You can look forward to a longer and healthier life if you join the 48 million Americans who have quit using tobacco. The steps for quitting described here are discussed in terms of the most popular tobacco product in the United States—cigarettes—but they can be adapted for all forms of tobacco.

Gather Information

Collect personal smoking information in a detailed journal about your smoking behavior. Write down the time you smoke each cigarette of the day, the situation you are in, how you feel, where you smoke, and how strong your craving for the cigarette is, plus any other information that seems relevant. Part of the job is to identify patterns of smoking that are connected with routine situations (for example, the after-dinner cigarette, the coffee break smoke, the tension reduction cigarette). Use this information to discover the behavior patterns involved in your smoking habit.

Make the Decision to Quit

Choose a date in the near future when you expect to be relatively stress-free and can give quitting the energy and attention it will require. Don't choose a date right before or during finals week, for instance. Consider making quitting a gift: choose your birthday as your quit date, for example, or make quitting a Father's Day or Mother's Day present. You might also want to coordinate your quit date with a buddy—a fellow tobacco user who wants to quit or a nonsmoker who wants to give up another bad habit or begin an exercise program. Tell your friends and family when you plan to quit. Ask them to offer

encouragement and help hold you to your goal.

Decide what approach to quitting will work best for you. Will you go cold turkey, or will you taper off? Will you use nicotine patches or gum? Will you join a support group or enlist the help of a buddy? Prepare a contract for quitting, as discussed in Chapter 1. Set firm dates and rewards, and sign the contract. Post it in a prominent place.

Prepare to Quit

One of the most important things you can do to prepare to quit is to develop and practice nonsmoking relaxation techniques. Many smokers find that they use cigarettes to help them unwind in tense situations or to relax at other times. If this is true for you, you'll need to find and develop effective substitutes. It takes time to become proficient at relaxation techniques, so begin practicing before your quit date. Refer to the detailed discussion of relaxation techniques in Chapter 2.

Other things you can do to help prepare for quitting include the following:

- Make an appointment to see your physician. Ask about OTC and prescription aids for tobacco cessation and whether one or more might be appropriate for you.
- Make a dentist's appointment to have your teeth cleaned the day after your target quit date.
- Start an easy exercise program if you're not exercising regularly already.
- Buy some sugarless gum. Stock your kitchen with low-calorie snacks.
- Clean and air out your car, and air out your house. Wash all your clothes and linens, and dry clean any nonwashable clothes.

- Throw away all your cigarette-related paraphernalia (ashtrays, lighters, and so on).
- The night before your quit day, get rid of all your cigarettes. Have fun with this—get your friends or family to help you tear them up.
- Make your last few days of smoking inconvenient: smoke only outdoors and when alone. Don't do anything else while you smoke.

Quitting

Your first few days without cigarettes will probably be the most difficult. It's hard to give up such a strongly ingrained habit, but remember that millions of Americans have done it—and you can, too. Plan and rehearse the steps you will take when you experience a powerful craving. Avoid or control situations that you know from your journal are powerfully associated with your smoking (see the accompanying table). If your hands feel empty without a cigarette, try holding or fiddling with a small object such as a paper clip, pencil, or small toy.

Social support can also be a big help. Arrange with a buddy to help you with your weak moments, and call him or her whenever you feel overwhelmed by an urge to smoke. Tell people you've just quit. You may discover many inspiring former smokers who can encourage you and reassure you that it's possible to quit and lead a happier, healthier life. Find a formal support group to join if you think it will help.

Maintaining Nonsmoking

The lingering smoking urges that remain once you've quit should be carefully tracked and controlled because they can

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cause relapses if left unattended. Keep track of these urges in your journal to help you deal with them. If certain situations still trigger the urge for a cigarette, change something about those situations to break past associations. If stress or boredom causes strong smoking urges, use a relaxation technique, take a brisk walk, have a stick of gum, or substitute some other activity for smoking.

Don't set yourself up for a relapse. If you allow yourself to get overwhelmed at school or work or to gain weight, it will be easier to convince yourself that now isn't the right time to quit. This *is* the right time.

Continue to practice time management and relaxation techniques. Exercise regularly, eat sensibly, and get enough sleep. These habits not only will ensure your success at remaining tobacco-free but also will serve you well in stressful times throughout your life. In fact, former smokers who have quit for at least three months report reduced stress levels, probably because quitting smoking lowers overall arousal.

Watch out for patterns of thinking that can make not smoking more difficult. Focus on the positive aspects of not smoking, and give yourself lots of praise—you

deserve it. Stick with the schedule of rewards you developed for your contract.

Keep track of the emerging benefits that come from having quit. Items that might appear on your list include improved stamina, an increased sense of pride at having kicked a strong addiction, a sharper sense of taste and smell, no more smoker's cough, and so on. Keep track of the money you're saving by not smoking, and spend it on things you really enjoy. And if you do lapse, be gentle with yourself. Lapses are a normal part of quitting. Forgive yourself, and pick up where you left off.

STRATEGIES FOR DEALING WITH HIGH-RISK SMOKING SITUATIONS

Cues and High-Risk Situations

Suggested Strategies

Awakening in the morning

Brush your teeth as soon as you wake up.
Take a shower or bath.

Drinking coffee

Do something else with your hands.
Drink tea or another beverage instead.

Eating meals

Sit in nonsmoking sections of restaurants.
Get up from the table right after eating, and start another activity.
Brush your teeth right after eating.

Driving a car

Clean the car thoroughly and air it out when you quit smoking.
Chew sugarless gum or eat a low-calorie snack.
Take public transportation or ride your bike.
Turn on the radio and sing along.

Socializing with friends who smoke

Suggest nonsmoking events (movies, theater, shopping).
Tell friends you've quit and ask them not to smoke around you, offer you cigarettes, or give you cigarettes if you ask for them.

Drinking at a bar, restaurant, or party

Try to take a nonsmoker with you, or associate with nonsmokers.
Let friends know you've just quit.
Moderate your intake of alcohol (it can weaken your resolve).

Encountering stressful situations

Practice relaxation techniques. Take some deep breaths.
Get out of your room or house. Go somewhere that doesn't allow smoking.
Take a shower, chew gum, call a friend, or exercise.

SOURCES: Adapted from *Postgraduate Medicine* 90(1), Kraner, S. E., and K. E. Graham. "Helping your patients who smoke quit for good: A quick and easy approach" pp. 233–248. Copyright 1991, with permission from JTE MULTIMEDIA.

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Nutrition Basics



LOOKING AHEAD...

After reading this chapter, you should be able to

- List the essential nutrients, and describe the functions they perform in the body
- Describe the guidelines that have been developed to help people choose a healthy diet, avoid nutritional deficiencies, and reduce their risk of diet-related chronic diseases
- Discuss nutritional guidelines for vegetarians and for special population groups
- Explain how to use food labels and other consumer tools to make informed choices about foods
- Put together a personal nutrition plan based on affordable foods that you enjoy and that promote wellness, today as well as in the future

TEST YOUR KNOWLEDGE

1. It is recommended that all adults consume one serving each of fruits and vegetables every day.
True or false?
2. How many french fries are considered to be one half-cup serving?
 - a. 10
 - b. 15
 - c. 25
3. Candy is the leading source of added sugars in the American diet.
True or false?
4. Which of the following is not a whole grain?
 - a. Brown rice
 - b. Wheat flour
 - c. Popcorn
5. Nutritionists advise reduced intake of trans fats for which of the following reasons?
 - a. They increase levels of low-density lipoproteins (LDL), or “bad” cholesterol.
 - b. They provide more calories than other types of fat.
 - c. They increase the risk of heart disease.

ANSWERS

1. **FALSE.** The recommendation for someone consuming 2000 calories daily is 2½ cups of vegetables and 2 cups of fruit.
2. **A.** Many people underestimate the size of the portions they eat, leading them to consume too many calories and too much fat.
3. **FALSE.** Regular (nondiet) sodas are the leading source of sugar and of calories, with an average of 55 gallons consumed per person per year. Each 12-ounce soda supplies about 10 teaspoons of sugar, or nearly 10% of the calories in a 2000-calorie diet.
4. **B.** Unless labeled as whole wheat, wheat flour is processed to remove the bran and the germ and is not a whole grain.
5. **A AND C.** High intake of trans fats raises LDL levels and the risk of heart disease.

In your lifetime, you'll spend about six years eating—about 70,000 meals and 60 tons of food. What you eat can have profound effects on your health and well-being. Your nutritional habits help determine your risk of major chronic diseases, including heart disease, cancer, stroke, and diabetes. Choosing foods that provide the nutrients you need while limiting the substances linked to disease should be an important part of your daily life.

Choosing a healthy diet is a two-part process. First, you have to know which nutrients you need and in what amounts. Second, you have to translate those require-

ments into a diet consisting of foods you like that are both available and affordable and that fit into your lifestyle. Once you know what constitutes a healthy diet for you, you can adjust your current diet to bring it into line with your goals.

This chapter explains the basic principles of **nutrition**. It introduces the six classes of essential nutrients and explains their roles in the functioning of the body. It also provides guidelines that you can use to design a healthy diet plan. Finally, this chapter offers practical tools and advice to help you apply the guidelines to your own life.

Table 12.1**The Six Classes of Essential Nutrients**

NUTRIENT	FUNCTION	MAJOR SOURCES
Proteins (4 calories/gram)	Form important parts of muscles, bone, blood, enzymes, some hormones, and cell membranes; repair tissue; regulate water and acid–base balance; help in growth; supply energy	Meat, fish, poultry, eggs, milk products, legumes, nuts
Carbohydrates (4 calories/gram)	Supply energy to cells in brain, nervous system, and blood; supply energy to muscles during exercise	Grains (breads and cereals), fruits, vegetables, milk
Fats (9 calories/gram)	Supply energy; insulate, support, and cushion organs; provide medium for absorption of fat-soluble vitamins	Animal foods, grains, nuts, seeds, fish, vegetables
Vitamins	Promote (initiate or speed up) specific chemical reactions within cells	Abundant in fruits, vegetables, and grains; also found in meat and dairy products
Minerals	Help regulate body functions; aid in growth and maintenance of body tissues; act as catalysts for release of energy	Found in most food groups
Water	Makes up 50–60% of body weight; provides medium for chemical reactions; transports chemicals; regulates temperature; removes waste products	Fruits, vegetables, liquids

NUTRITIONAL REQUIREMENTS: COMPONENTS OF A HEALTHY DIET

You probably think about your diet in terms of the foods you like to eat. More important for your health, though, are the nutrients contained in those foods. Your body requires proteins, fats, carbohydrates, vitamins, minerals, and water—about **45 essential nutrients**. In this context, the word *essential* means that you must get these substances from food because your body is unable to manufacture them, or at least do so fast enough, to meet your physiological needs. The six classes of nutrients, along with their functions and major sources, are listed in Table 12.1. The body needs some essential nutrients in relatively large amounts; these **macronutrients** include protein, fat, carbohydrate, and water. **Micronutrients**, such as vitamins and minerals, are required in much smaller amounts.

Your body obtains nutrients through the process of **digestion**, in which the foods you eat are broken down into compounds your gastrointestinal tract can absorb and your body can use (Figure 12.1). A diet that provides enough essential nutrients is vital because various nutrients provide energy,

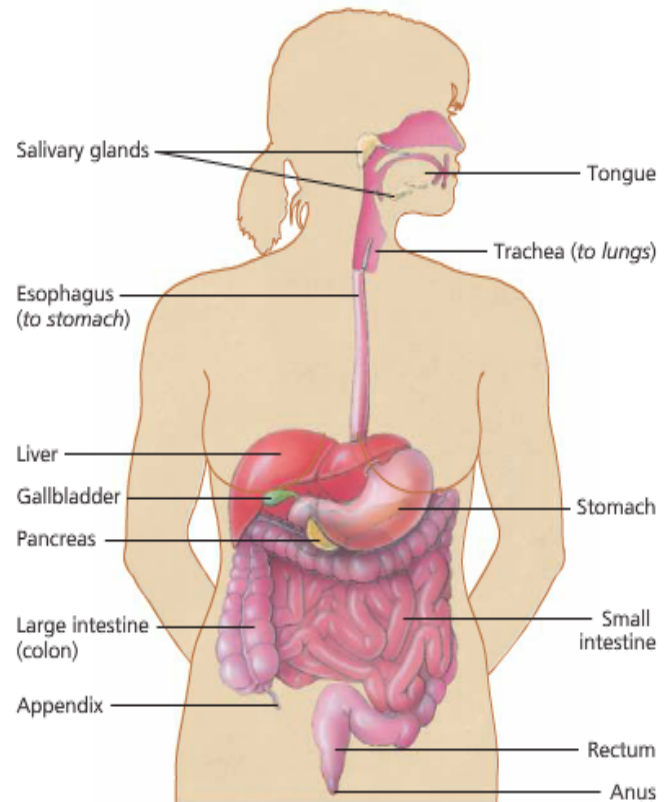


FIGURE 12.1 The digestive system. Food is partially broken down by being chewed and mixed with saliva in the mouth. After traveling to the stomach via the esophagus, food is broken down further by stomach acids and other secretions. As food moves through the digestive tract, it is mixed by muscular contractions and broken down by chemicals. Most absorption of nutrients occurs in the small intestine, aided by secretions from the pancreas, gallbladder, and intestinal lining. The large intestine reabsorbs excess water; the remaining solid wastes are collected in the rectum and excreted through the anus.

nutrition The science of food and how the body uses it in health and disease.

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essential nutrients Substances the body must get from foods because it cannot manufacture them at all or fast enough to meet its needs. These nutrients include proteins, fats, carbohydrates, vitamins, minerals, and water.

macronutrient An essential nutrient required by the body in relatively large amounts.

micronutrient An essential nutrient required by the body in minute amounts.

digestion The process of breaking down foods into compounds the gastrointestinal tract can absorb and the body can use.

help build and maintain body tissues, and help regulate body functions (see the box “Eating Habits and Total Wellness”).

Calories

The energy in foods is expressed as **kilocalories**. One kilocalorie represents the amount of heat required to raise the temperature of 1 liter of water 1°C. A person needs about 2000 kilocalories per day to meet his or her energy needs. In common usage, people usually refer to kilocalories as *calories*, which is technically a much smaller energy unit (1 kilocalorie contains 1000 calories). This text uses the familiar word *calorie* to stand for the larger energy unit; you’ll also find the word *calorie* used on food labels.

Of the six classes of essential nutrients, three supply energy:

- Fat = 9 calories per gram.
- Protein = 4 calories per gram.
- Carbohydrate = 4 calories per gram.

Alcohol, though not an essential nutrient, also supplies energy, providing 7 calories per gram. (One gram equals a little less than .04 ounce.) The high caloric content of fat is one reason why experts often advise against high fat consumption. Most people do not need the extra calories to meet energy needs. Regardless of their source, calories consumed in excess of energy needs are converted to fat and stored in the body.

Just meeting energy needs is not enough. Your body needs enough of the essential nutrients to function properly. Nearly all foods contain combinations of nutrients, although foods are commonly classified according to their predominant nutrient; for example, spaghetti is thought of as a carbohydrate. The following sections discuss the function and sources of each class of nutrients.

Proteins—The Basis of Body Structure

Proteins form important parts of the body’s main structural components: muscles and bones. Proteins also form important parts of blood, enzymes, some hormones, and cell membranes. When consumed, proteins also provide energy (4 calories per gram) for the body.

Amino Acids The building blocks of proteins are called **amino acids**. Twenty common amino acids are found in food.

kilocalorie A measure of energy content in food; 1 kilocalorie represents the amount of heat needed to raise the temperature of 1 liter of water 1°C; commonly referred to as a *calorie*.

protein An essential nutrient that forms important parts of the body’s main structures (muscles and bones) as well as blood, enzymes, hormones, and cell membranes; also provides energy.

amino acid One of the building blocks of proteins; 20 common amino acids are found in foods.

QUICK STATS
Worldwide, almost
1 billion people
don’t get enough to
eat on a daily basis.

—Science, 2010

Nine of these are essential (or indispensable). The other eleven amino acids can be produced by the body, given the presence of the needed components supplied by foods.

Complete and Incomplete Proteins Individual protein sources are considered *complete* if they supply all the essential amino acids in adequate amounts and *incomplete* if they do not. Meat, fish, poultry, eggs, milk, cheese, and soy provide complete proteins. Incomplete proteins, which come from other plant sources such as legumes and nuts, are good sources of most essential amino acids but are usually low in one or more.

Certain combinations of vegetable proteins, such as wheat and peanuts in a peanut butter sandwich, allow each vegetable protein to make up for the amino acids missing in the other protein. The combination yields a complete protein. Many traditional food pairings, such as beans and rice or corn and beans, may have emerged as dietary staples because they are complementary proteins.

It was once believed that vegetarians had to complement their proteins at each meal to receive the benefit of a complete protein. It is now known, however, that proteins consumed throughout the course of the day can complement each other to form a pool of amino acids the body can draw from to produce the necessary proteins in the body. Vegetarians should include a variety of vegetable protein sources in their diets to make sure they get all the essential amino acids in adequate amounts. (Healthy vegetarian diets are discussed later in the chapter.) About two-thirds of the protein in the typical American diet comes from animal sources (meat and dairy products); therefore, the American diet is rich in essential amino acids.

Recommended Protein Intake Adequate daily intake of protein for adults is 0.8 gram per kilogram (0.36 gram per pound) of body weight, corresponding to 50 grams of protein per day for someone who weighs 140 pounds and 65 grams of protein for someone who weighs 180 pounds. Table 12.2 lists some popular food items and the amount of protein each one provides.

Table 12.2 Protein Content of Common Food Items

ITEM	PROTEIN (GRAMS)
3 ounces lean meat, poultry, or fish	20–25
½ cup tofu	20–25
1 cup dried beans	15–20
1 cup milk or yogurt	8–12
1½ ounces cheese	8–12
1 serving of cereals, grains, nuts, vegetables	2–4

EMBRACING WELLNESS

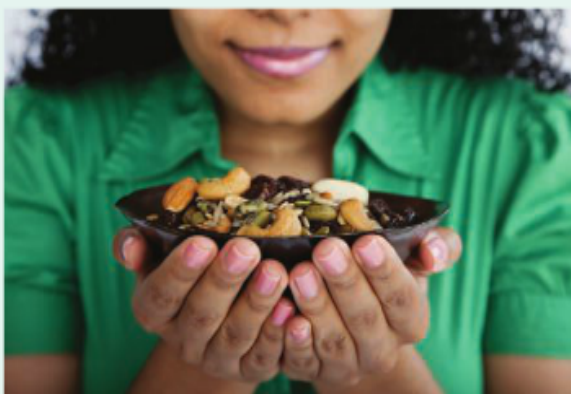
Eating Habits and Total Wellness



Healthy eating does more than nourish your body—it enhances your ability to enjoy life to the fullest by improving overall wellness, both physical and mental. One study examined a group of adults who followed a healthy eating plan for four years. At the end of this period, the study subjects were more confident with their food choices and more satisfied with their lives in general than their peers who did not make any dietary changes. The reverse is also true—when people overeat, they often have feelings of guilt, anger, discouragement, and even self-loathing. Out-of-control eating can erode self-confidence and lead to depression.

Can individual foods affect the way we feel? Limited scientific evidence points to some correlation between certain foods and one's mood. Many people, especially women, seem to crave chocolate when they feel slightly depressed. Studies show that chocolate, in small quantities, may indeed give you a lift. Sugary foods tend to temporarily raise serotonin levels in the brain, which can improve mood (serotonin is a neurotransmitter associated with a calm, relaxed state). The fat found in chocolate acts to increase endorphins—brain chemicals that reduce pain and increase feelings of well-being. Chocolate also contains a variety of other less studied chemicals that may have a positive impact on mood.

Some recent research shows that eating certain carbohydrate-rich foods, such as a plain baked potato or a bagel with jelly,



can have a temporary calming effect. This effect is most pronounced when rapidly digestible carbohydrates are consumed alone, with no fats or proteins in the meal. The practical implications of this research are uncertain.

If you are looking for a mental boost, some scientists think that eating a meal consisting primarily of protein-rich foods may be helpful. The theory is that proteins contain the amino acid tyrosine, which

the body uses to make the neurotransmitters dopamine and norepinephrine. Some researchers think that eating protein-rich foods could increase the synthesis of these neurotransmitters, which can speed reaction time and increase alertness. Whether this really works, especially in well-nourished individuals who have not been lacking these nutrients to begin with, remains unclear. In the meantime, it wouldn't hurt, and might even help, to include some protein in the meal you eat prior to your next big exam.

SOURCE: Fahey, T. D., P. M. Insel, and W. T. Roth. 2010. *Fit and Well*, 9th ed. New York: McGraw-Hill. Copyright © 2010 The McGraw-Hill Companies, Inc.

connect
ACTIVITY
DO IT ONLINE

Most Americans meet or exceed the protein intake needed for adequate nutrition. If you consume more protein than your body needs, the extra energy from protein is synthesized into fat for storage or burned for energy requirements. A little extra protein is not harmful, but it can contribute excess calories and fat to the diet because protein-rich foods can be high in fat (especially saturated fat), as well.

Recommendations for protein intake (and intake of other nutrients) as a percentage of total daily calorie intake have been published by the Food and Nutrition Board of the Institute of Medicine. These recommendations, called Acceptable Macronutrient Distribution Ranges (AMDRs), are based on ensuring adequate intake of essential nutrients while also reducing the risk of chronic diseases. A fairly broad range of protein intakes is associated with good health; the AMDR for protein is 10–35% of total daily calorie intake, depending on the individual's age. Because most people in the United States meet the recommendations for protein, the 2010

Dietary Guidelines for Americans emphasize a variety of low-fat protein choices to encourage people to avoid consuming too many calories.

Fats—Essential in Small Amounts

Fats, also known as *lipids*, are the most concentrated source of energy, at 9 calories per gram. The fats stored in your body represent usable energy, they help insulate your body, and they support and cushion your organs. Fats in the diet help your body to absorb fat-soluble vitamins, and they add important flavor and texture to foods. Fats are the major fuel for the body during rest and light activity.

Two fats, linoleic acid and alpha-linolenic acid, are essential components of the diet. They are used to make compounds that are key regulators of such body functions as the maintenance of blood pressure and the progress of a healthy pregnancy.

Types and Sources of Fats Most of the fats in foods are fairly similar in composition, generally including a molecule of glycerol (an alcohol) with three fatty acid chains attached to it. The resulting structure is called a *triglyceride*. Animal fat, for example, is made primarily of triglycerides.

Within a triglyceride, differences in the fatty acid structure result in different types of fats. Depending on this structure, a fat may be unsaturated, monounsaturated, polyunsaturated, or saturated. (The essential fatty acids—linoleic and alpha-linolenic acids—are both polyunsaturated.) The different types of fatty acids have different characteristics and different effects on your health. The types of fatty acids and their effects on health are summarized in Table 12.3.

Food fats are usually composed of both saturated and unsaturated fatty acids; the dominant type of fatty acid determines the fat's characteristics. Food fats containing large amounts of saturated fatty acids are usually solid at room temperature; they are generally found naturally in animal products. The leading sources of saturated fat in the American diet are red meats (hamburger, steak, roasts), whole milk, cheese, hot dogs, and lunch meats. Food fats containing large amounts

The softer or more liquid a fat is (such as tub or squeeze margarines), the less saturated and trans fat it is likely to contain.

of monounsaturated and polyunsaturated fatty acids usually come from plant sources and are liquid at room temperature. Olive, canola, safflower, and peanut oils contain mostly monounsaturated fatty acids. Soybean, corn, and cottonseed oils contain mostly polyunsaturated fatty acids.

Hydrogenation and Trans Fats When unsaturated vegetable oils undergo the chemical process known as **hydrogenation**, the result is a more solid fat that contains a mixture of saturated and unsaturated fatty acids. Hydrogenation also changes some unsaturated fatty acids to **trans fatty acids**—

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hydrogenation A chemical process by which hydrogen atoms are added to molecules of unsaturated fats, increasing the degree of saturation and turning liquid oils into solid fats. Hydrogenation produces a mixture of saturated fatty acids and standard and trans forms of unsaturated fatty acids.

trans fatty acid A type of unsaturated fatty acid produced during the process of hydrogenation; trans fats have an atypical shape that affects their chemical activity.

Table 12.3 Types of Fatty Acids and Their Possible Effects on Health

	TYPE OF FATTY ACID	FOUND IN ^a	POSSIBLE EFFECTS ON HEALTH
Keep Intake Low	Saturated	- Animal fats (especially fatty meats and poultry fat and skin) - Butter, cheese, and other high-fat dairy products - Palm and coconut oils	- Raises total cholesterol and LDL cholesterol - May increase risk of heart disease - May increase risk of certain types of cancers
	Trans	- Deep-fried fast foods - Stick margarines, shortening - Packaged cookies and crackers - Processed snacks and sweets	- Raises total cholesterol and LDL cholesterol - Lowers HDL cholesterol - May increase risk of heart disease and some cancers
	Monounsaturated	- Olive, canola, and safflower oils - Avocados, olives - Peanut butter (without added fat) - Many nuts, including almonds, cashews, pecans, and pistachios	- Lowers total cholesterol and LDL cholesterol - May reduce blood pressure and lower triglycerides (a risk factor for heart disease) - May reduce risk of heart disease, stroke, and some cancers
Choose Moderate Amounts	POLYUNSATURATED (two groups) ^b		
	Omega-3	- Fatty fish, including salmon, white albacore tuna, mackerel, anchovies, and sardines - Lesser amounts in walnut, flaxseed, canola, and soybean oils; tofu, walnuts; flaxseeds; and dark green leafy vegetables	- Reduces blood clotting and inflammation and inhibits abnormal heart rhythms - Lowers triglycerides - May lower blood pressure in some people - May reduce risk of fatal heart attack, stroke, and some cancers
	Omega-6	Corn, soybean, and cottonseed oils (often used in margarine, mayonnaise, and salad dressings)	- Lowers total cholesterol and LDL cholesterol - May lower HDL cholesterol - May reduce risk of heart disease - May slightly increase risk of cancer if omega-6 intake is high and omega-3 intake is low
^a Food fats contain a combination of types of fatty acids in various proportions. For example, canola oil is composed mainly of monounsaturated fatty acids (62%) but also contains polyunsaturated (32%) and saturated (6%) fatty acids. Food fats are categorized here according to their predominant fatty acid.			
^b The essential fatty acids are polyunsaturated: linoleic acid is an omega-6 fatty acid and alpha-linolenic acid is an omega-3 fatty acid.			

unsaturated fatty acids with an atypical shape that affects their behavior in the body.

Food manufacturers use hydrogenation to increase the stability of an oil so it can be reused for deep frying, to improve the texture of certain foods (to make pie crusts flakier, for example), and to extend the shelf life of foods made with oil. Hydrogenation is also used to transform a liquid oil into margarine or vegetable shortening.

Small amounts of trans fats occur naturally in animal fat, particularly beef, lamb, and dairy products; but the majority of trans fat in the American diet comes from partially hydrogenated oils. Many baked and fried foods are prepared with hydrogenated vegetable oils, so they can be relatively high in saturated and trans fatty acids. Leading sources of trans fats in the American diet are fried fast foods such as french fries and fried chicken (typically fried in vegetable shortening rather than oil), baked and snack foods, and stick margarine.

In general, the more solid a hydrogenated oil is, the more saturated or trans fats it contains; for example, stick margarines typically contain more saturated and trans fats than do tub or squeeze margarines.

Hydrogenated vegetable oils are not the only plant fats that contain saturated fats. Palm and coconut oils, although derived from plants, are also highly saturated. However, fish oils, unlike many oils derived from animal sources, are rich in polyunsaturated fats.

Fats and Health Different types of fats have very different effects on health. Many studies have examined the effects of dietary fat intake on blood **cholesterol** levels and the risk of heart disease. Saturated and trans fatty acids raise blood levels of **low-density lipoprotein (LDL)**, or “bad” cholesterol. Unsaturated fatty acids lower LDL. Monounsaturated fatty acids, such as those found in olive and canola oils, may also increase levels of **high-density lipoproteins (HDL)**, or “good” cholesterol, providing even greater benefits for heart health. In large amounts, trans fatty acids may lower HDL. Thus it is important to choose unsaturated fats instead of saturated and trans fats to reduce the risk of heart disease. (See Chapter 15 for more about cholesterol.)

Most Americans consume 4–5 times as much saturated fat as trans fat (8–10% versus 2% of total daily calories). However, health experts are particularly concerned about trans fats because of their double-negative effect on heart health—they both raise LDL and lower HDL. Consuming trans fats increases the risk of both cardiovascular disease and type 2 diabetes. In recent years, as awareness of these health risks has grown, cities and states have banned the use of trans fats in restaurants and food prepared for retail sale, and food manufacturers have reduced the amount of trans fats they use. According to the Center for Science in the Public Interest, the amount of trans fat added to our food has declined by more than 50% since 2005. By federal regulation, the trans fat content of packaged food items is listed on their labels. Consumers can also check for the presence of trans fats by examining the ingredient list of a food for partially hydrogenated oil or vegetable shortening.

The best way to reduce saturated fat in your diet is to lower your intake of meat and full-fat dairy products (whole milk, cream, butter, cheese, yogurt, ice cream). To lower trans fats, decrease your intake of deep-fried foods and baked goods made with hydrogenated vegetable oils (such as many kinds of crackers and cookies), use liquid oils for cooking, and favor tub or squeeze margarines over stick margarines. Remember: the softer or more liquid a fat is, the less saturated and trans fat it is likely to contain.

Although saturated and trans fats pose health hazards, other fats can be beneficial. When used in place of saturated fats, monounsaturated fatty acids—found in avocados, most nuts, and olive, canola, peanut, and safflower oils—improve cholesterol levels and may help protect against some cancers.

Omega-3 fatty acids, a form of polyunsaturated fat found primarily in fish, may be even more healthful. Foods rich in omega-3s are important because they contain the essential nutrient alpha-linolenic acid. Omega-3s and the compounds the body makes from them have a number of heart-healthy effects: they reduce the tendency of blood to clot, inhibit inflammation and abnormal heart rhythms, and reduce blood pressure and risk of heart attack and stroke in some people. Because of these benefits, nutritionists recommend that Americans increase the proportion of omega-3s in their diet by eating fish two or more times a week. Salmon, tuna, trout, mackerel, herring, sardines, and anchovies are all good sources of omega-3s. Lesser amounts are found in plant foods, including dark-green leafy vegetables; walnuts; flaxseeds; and canola, walnut, and flaxseed oils.

Most of the polyunsaturated fats currently consumed by Americans are **omega-6 fatty acids**, primarily from corn oil and soybean oil. Foods rich in omega-6s are important because they contain the essential nutrient linoleic acid. The American Heart Association (AHA) recommends consuming at least 5–10% of energy from omega-6 fatty acids as part of a low-saturated-fat and low-cholesterol diet, to reduce the risk of coronary heart disease.

In addition to its effects on heart disease risk, dietary fat can affect health in other ways. Diets high in fatty red meat are associated with an increased risk of certain forms of cancer,

cholesterol A waxy substance in the blood and cells, needed for synthesis of cell membranes, vitamin D, and hormones.

low-density lipoprotein (LDL) Blood fat that transports cholesterol to organs and tissues; excess amounts result in the accumulation of deposits on artery walls.

high-density lipoprotein (HDL) Blood fat that helps transport cholesterol out of the arteries, thereby protecting against heart disease.

omega-3 fatty acids Polyunsaturated fatty acids commonly found in fish oils; beneficial to cardiovascular health.

omega-6 fatty acids Polyunsaturated fatty acids found commonly in soybean and corn oil; beneficial for cardiovascular health.

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especially colon cancer. A high-fat diet can also make weight management more difficult. Because fat is a concentrated source of calories, a high-fat diet is often a high-calorie diet that can lead to weight gain.

Although more research is needed on the precise effects of different types and amounts of fat on overall health, a great deal of evidence points to the fact that most people benefit from keeping their overall fat intake at recommended levels and choosing unsaturated fats instead of saturated and trans fats.

Recommended Fat Intake To meet the body's demand for essential fats, adult men need about 17 grams per day of linoleic acid and 1.6 grams per day of alpha-linolenic acid; adult women need 12 grams of linoleic acid and 1.1 grams of alpha-linolenic acid. It takes only 3–4 teaspoons (15–20 grams) of vegetable oil per day incorporated into your diet to supply the essential fats. Most Americans consume sufficient amounts of the essential fats; limiting unhealthy fats is a much greater health concern.

Limits for total fat, saturated fat, and trans fat intake have been set by a number of government and research organizations. As with protein, a range of levels of fat consumption is associated with good health; the AMDR for total fat is 20–35% of total calories. Although more difficult for consumers to monitor, AMDRs have also been set for omega-6 fatty acids (5–10%) and omega-3 fatty acids (0.6–1.2%) as part of total fat intake. Because any amount of saturated and trans fats increases the risk of heart disease, the Food and Nutrition Board recommends that saturated fat and trans fat intake be kept as low as possible; most fat in a healthy diet should be unsaturated.

For advice on setting individual intake goals, see the box “Setting Intake Goals for Protein, Fat, and Carbohydrate.” To determine how close you are to meeting your personal intake goals for fat, keep a running total over the course of the day. For prepared foods, food labels list the numbers of grams of fat, protein, and carbohydrate. Nutrition information is also available in many grocery stores, in inexpensive published nutrition guides, and online (see “For More Information” at the end of the chapter). By checking these resources, you can keep track of the total grams of fat, protein, and carbohydrate you eat and assess your current diet.

You can still eat high-fat foods, but it makes sense to limit the size of your portions and to balance your intake with low-fat foods. For example, peanut butter is high in fat, with 8 grams (72 calories) of fat in each 90-calorie tablespoon. Two tablespoons of peanut butter eaten on whole-wheat bread and served with a banana, carrot sticks, and a glass of fat-free milk make a nutritious lunch—high in protein and carbohydrate and overall, relatively low in fat (500 calories, 18 grams of total fat, 4 grams of saturated fat). In comparison, four tablespoons of peanut butter on high-fat crackers with potato chips, cookies, and whole milk is a less healthy combination (1000 calories, 62 grams of total fat, 15 grams of saturated fat). So although it's important to evaluate individual food items for their fat content, it's more important to look at them in the context of your overall diet.

Carbohydrates—An Ideal Source of Energy

Carbohydrates are needed in the diet primarily to supply energy for body cells. Some cells, such as those found in the brain and other parts of the nervous system and in blood, use only the carbohydrate glucose for fuel. During high-intensity exercise, muscles also use energy from carbohydrates as their primary fuel source.

When we don't eat enough carbohydrates to satisfy the needs of the brain and red blood cells, our bodies synthesize fuel from proteins. In situations of extreme deprivation, when the diet lacks a sufficient amount of both carbohydrates and proteins, the body turns to its own organs and tissues, breaking down proteins in muscles, the heart, kidneys, and other vital organs to supply carbohydrate needs. This rarely occurs, however, because eating the equivalent of just three or four slices of bread supplies the body's daily minimum need for carbohydrates.

Simple and Complex Carbohydrates Carbohydrates are classified into two groups: simple and complex. *Simple carbohydrates* include single sugar molecules (monosaccharides) and double sugar molecules (disaccharides). The monosaccharides are glucose, fructose, and galactose. Glucose is the most common sugar and is used by both animals and plants for energy. Fructose is a very sweet sugar that is found in fruits, and galactose is the sugar in milk. The disaccharides are pairs of single sugars; they include sucrose or table sugar (fructose + glucose), maltose or malt sugar (glucose + glucose), and lactose or milk sugar (galactose + glucose). Simple carbohydrates add sweetness to foods; they are found naturally in fruits and milk and are added to soft drinks, fruit drinks, candy, and sweet desserts. There is no evidence that any type of simple carbohydrate is more nutritious than any others.

Complex carbohydrates include starches and most types of dietary fiber. Starches are found in a variety of plants, especially grains (wheat, rye, rice, oats, barley, millet), legumes (dry beans, peas, and lentils), and tubers (potatoes and yams). Most other vegetables contain a mixture of complex and simple carbohydrates. Fiber, discussed in the next section, is found in grains, fruits, and vegetables.

During digestion, your body breaks down carbohydrates into simple sugar molecules, such as **glucose**, for absorption. Once glucose is in the bloodstream, the pancreas releases the hormone insulin, which allows cells to take up glucose and use it for energy. The liver and muscles take up glucose to provide carbohydrate storage in the form of a starch called **glycogen**.

carbohydrate An essential nutrient, required for energy for cells; sugars, starches, and dietary fiber are all carbohydrates.

glucose A simple sugar that is the body's basic fuel.

glycogen A starch stored in the liver and muscles.

TERMS

TAKE CHARGE

Setting Intake Goals for Protein, Fat, and Carbohydrate



The Food and Nutrition Board has established goals to help ensure adequate intake of the essential amino acids, fatty acids, and carbohydrate. The daily goals for adults follow:

	MEN	WOMEN
Protein	56 grams	46 grams
Fat: linoleic acid	17 grams	12 grams
Alpha-linolenic acid	1.6 grams	1.1 grams
Carbohydrate	130 grams	130 grams

Protein intake goals can be calculated more specifically by multiplying your body weight in kilograms by 0.8 or your body weight in pounds by 0.36. (Refer to the “Nutrition Resources” section at the end of the chapter for information for specific age groups and life stages.)

To meet your daily energy needs, you need to consume more than the minimally adequate amounts of the energy-providing nutrients listed here, which alone supply only about 800–900 calories.

The Food and Nutrition Board provides additional guidance in the form of Acceptable Macronutrient Distribution Ranges (AMDRs), as noted in the text. The ranges can help you balance

your intake of the energy-providing nutrients in ways that ensure adequate intake while reducing the risk of chronic disease. The AMDRs for protein, total fat, and carbohydrate follow:

Protein	10–35% of total daily calories
Total fat	20–35% of total daily calories
Carbohydrate	45–65% of total daily calories

To set individual goals, begin by estimating your total daily energy (calorie) needs. If your weight is stable, your current energy intake is the number of calories needed to maintain your weight at your current activity level. Next select percentage goals for protein, fat, and carbohydrate. You can allocate your total daily calories among the three classes of macronutrients to suit your preferences, but make sure that the three percentages you select total 100% and that you meet the minimum intake goals listed. Two samples reflecting different total energy intake and nutrient intake goals appear in the following table.

To translate your own percentage goals into daily intake goals expressed in calories and grams, multiply the appropriate percentages by total calorie intake and then divide the results by the corresponding calories per gram. For example, a fat limit of 35% applied to a 2200-calorie diet would be calculated as follows: $0.35 \times 2200 = 770$ calories of total fat; $770 \div 9$ calories per gram = 86 grams of total fat. (Remember that fat has 9 calories per gram and that protein and carbohydrate have 4 calories per gram.)

Two Sample Macronutrient Distributions

NUTRIENT	AMDR	SAMPLE 1		SAMPLE 2	
		INDIVIDUAL GOALS	AMOUNTS FOR A 1600-CALORIE DIET	INDIVIDUAL GOALS	AMOUNTS FOR A 2800-CALORIE DIET
Protein	10–35%	15%	240 calories = 60 grams	30%	840 calories = 210 grams
Fat	20–35%	30%	480 calories = 53 grams	25%	700 calories = 78 grams
Carbohydrate	45–65%	55%	880 calories = 220 grams	45%	1260 calories = 315 grams

SOURCE: From Food and Nutrition Board, Institute of Medicine. 2010. *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, DC: National Academies Press. Available online at http://www.nap.edu/openbook.php?record_id=11537&page1. Reprinted with permission from the National Academies Press, Copyright 2010, National Academy of Sciences.

Some people have problems controlling blood glucose levels, a disorder called *diabetes mellitus* (Chapter 14).

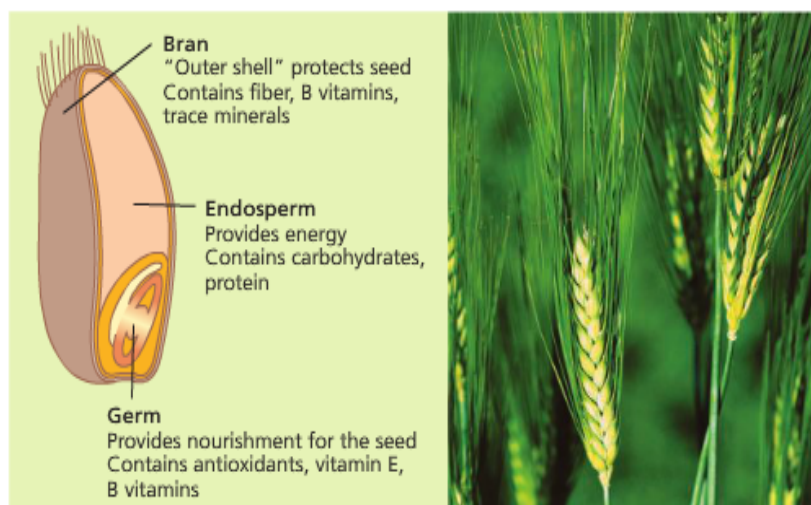
Refined Carbohydrates versus Whole Grains Complex carbohydrates can be further divided into refined, or processed, carbohydrates and unrefined carbohydrates, or whole grains. Before they are processed, all grains are **whole grains**, consisting of an inner layer, the germ; a middle layer, the endosperm; and an outer layer, the bran (Figure 12.2). During processing, the germ and bran are often removed,

leaving just the starchy endosperm. The refinement of whole grains transforms whole-wheat flour into white flour, brown rice into white rice, and so on.

whole grain The entire edible portion of a grain (such as wheat, rice, or oats), consisting of the germ, endosperm, and bran; processing removes parts of the grain, often leaving just the endosperm.

TERMS

FIGURE 12.2 The parts of a whole grain kernel.



Refined carbohydrates usually retain all the calories of their unrefined counterparts, but they tend to be much lower in fiber, vitamins, minerals, and other beneficial compounds. (Many refined grain products are enriched or fortified with vitamins and minerals, but not all of the nutrients lost in processing are replaced.)

Unrefined carbohydrates tend to take longer to chew and digest than refined ones; they also enter the bloodstream more slowly. This slower digestive pace tends to make people feel full sooner and for a longer period. Also, a slower rise in blood glucose levels following the consumption of complex carbohydrates may help in the management of diabetes. Whole grains are also high in dietary fiber and so have all the benefits of fiber (discussed later).

Consumption of whole grains has been linked to a reduced risk of heart disease, diabetes, and cancer and plays an important role in gastrointestinal health and body weight management. For all these reasons, whole grains are recommended over those that have been refined. This does not mean that you should never eat refined carbohydrates such as white bread or white rice—simply that whole-wheat bread, brown rice, and other whole grains are healthier choices. See the box “Choosing More Whole-Grain Foods” for tips on increasing your intake of whole grains.

Glycemic Index Insulin and glucose levels rise and fall following a meal or snack containing any type of carbohydrate. Some foods cause a quick and dramatic rise in glucose and insulin levels, while others have a slower, more moderate effect. A food that has a rapid effect on blood glucose levels is

QUICK STATS

The typical American diet contains **6.4 ounces of grains daily**, but only **0.6 ounces are whole grains**.

—Dietary Guidelines for Americans, 2010

said to have a high **glycemic index**. The glycemic index of a food indicates the type of carbohydrate in that food. High-glycemic-index foods do not, as some popular diets claim, directly cause weight gain beyond the calories they contain.

Attempting to base food choices on glycemic index is a difficult task. Unrefined complex carbohydrates and high-fiber foods generally tend to have a lower glycemic index, but patterns are less clear for other types of foods. The body's response to carbohydrates also depends on other factors, such as what other foods are consumed at the same time, as well as the individual's fitness status.

For people with particular health concerns, such as diabetes, glycemic index may be an important consideration in choosing foods. But for most people, the best bet is to choose a variety of vegetables daily and to limit foods that are high in added sugars and low in other nutrients.

Recommended Carbohydrate Intake On average, Americans consume 200–300 grams of carbohydrate per day—well above the 130 grams needed to meet the body's requirement for essential carbohydrate. A range of intakes is associated with good health; the AMDR for carbohydrates is 45–65% of total daily calories. That's about 225–325 grams of carbohydrate for someone who consumes 2000 calories per day. The focus should be on consuming a variety of foods rich in complex carbohydrates, especially whole grains.

Athletes in training can especially benefit from high-carbohydrate diets (60–70% of total daily calories), which enhance the amount of carbohydrates stored in their muscles and therefore provide more fuel for use during endurance events or long workouts. Carbohydrates consumed during prolonged athletic events (for example, sports beverages and gels) can provide fluid, electrolytes, and glucose to help fuel muscles and extend the availability of glycogen stored in muscles. Caution is in order, however, because overconsumption

glycemic index A measure of how a particular food affects blood glucose levels.

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TAKE CHARGE

Choosing More Whole-Grain Foods



Because whole-grain foods offer so many health benefits, federal dietary guidelines recommend six or more servings of grain products every day, with at least half of those servings from whole grains. Currently, however, Americans average less than one serving of whole grains per day.

What Are Whole Grains?

The first step in increasing your intake of whole grains is to correctly identify them. The following are whole grains:

Whole wheat	Whole-grain corn
Whole rye	Popcorn
Whole oats	Brown rice
Oatmeal	Whole-grain barley

More unusual choices include bulgur (cracked wheat), millet, kasha (roasted buckwheat kernels), quinoa, wheat and rye berries, amaranth, wild rice, graham flour, whole-grain kamut, whole-grain spelt, and whole-grain triticale.

Wheat flour, unbleached flour, enriched flour, and degerminated corn meal are not whole grains. Wheat germ and wheat bran are also not whole grains, but they are the constituents of wheat typically left out when wheat is processed and so are healthier choices than regular wheat flour, which typically contains just the grain's endosperm.

Checking Packages for Whole Grains

To find packaged foods—such as bread or pasta—that are rich in whole grains, read the list of ingredients and check for special health claims related to whole grains. The first item on the list of ingredients should be one of the whole grains in the preceding list. Product names and food color can be misleading. *When in doubt, always check the list of ingredients and make sure “whole” is the first word on the list.*

The FDA allows manufacturers to include special health claims for foods that contain 51% or more whole-grain ingredients. Such products may display a statement such as the following on their packaging:

“Rich in whole grain.”

“Made with 100% whole grain.”

“Diets rich in whole-grain foods may help reduce the risk of heart disease and certain cancers.”

However, many whole-grain products do not carry such claims. This is one more reason to check the ingredient list to make sure you're buying a product made from one or more whole grains.

of carbohydrates can lead to fatigue and underconsumption of other nutrients.

Added sugars—sugars that are added to foods—should not be a major contributor to the diet. Added sugars include the white and brown sugar and high-fructose corn syrup that are added to foods like candy, baked goods, and sodas and other sugar-sweetened beverages. Currently, added sugars contribute 16% of the total calories in the typical American diet. Foods high in added sugars are generally high in calories and low in nutrients and fiber, thus providing “empty calories.” The USDA Food Patterns recommendations (based on the Dietary Guidelines for Americans) are designed so that people can meet nutrient needs and have no more than 5–15% of calories from solid fats AND added sugars together. To reduce your intake of added sugars, limit soft drinks, candy, desserts, and sweetened fruit drinks. The sugars in your diet should come mainly from fruits, which are excellent sources of vitamins and minerals, and from low-fat or fat-free milk and other dairy products, which are high in protein and calcium.

Fiber—A Closer Look

Fiber is the term given to nondigestible carbohydrates provided by plants. Instead of being digested, like starch, fiber

moves through the intestinal tract and provides bulk for feces in the large intestine, which in turn facilitates elimination. In the large intestine, bacteria break down some types of fiber into acids and gases, which explains why consuming too much fiber can lead to intestinal gas. Even though humans don't digest fiber, it is necessary for good health.

Types of Fiber The Food and Nutrition Board has defined two types of fiber:

- **Dietary fiber** refers to the nondigestible carbohydrates (and the noncarbohydrate substance *lignin*) that are naturally present in plants such as grains, legumes, and vegetables.
- **Functional fiber** refers to nondigestible carbohydrates that have been either isolated from natural sources or synthesized in a lab and then added to a food product or dietary supplement.

dietary fiber Nondigestible carbohydrates and lignin that are intact in plants.

functional fiber Nondigestible carbohydrates either isolated from natural sources or synthesized; these may be added to foods and dietary supplements.

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Total fiber is the sum of dietary and functional fiber in one's diet.

Fibers have different properties that lead to different physiological effects in the body. For example, **soluble (viscous) fiber** such as that found in oat bran or legumes can delay stomach emptying, slow the movement of glucose into the blood after eating, and reduce absorption of cholesterol. **Insoluble fiber**, such as that found in wheat bran or psyllium seed, increases fecal bulk and helps prevent constipation, hemorrhoids, and other digestive disorders.

A high-fiber diet can help reduce the risk of type 2 diabetes, heart disease, and pulmonary disease, as well as improve gastrointestinal health and aid in the management of metabolic syndrome and body weight. Some studies have linked high-fiber diets with a reduced risk of colon and rectal cancer. Other studies have suggested that other characteristics of diets rich in fruits, vegetables, and whole grains may be responsible for this reduction in risk (see Chapter 16).

Sources of Fiber All plant foods contain some dietary fiber. Fruits, legumes, oats (especially oat bran), and barley all contain the viscous types of fiber that help lower blood glucose and cholesterol levels. Wheat (especially wheat bran), other grains and cereals, and vegetables are good sources of cellulose and other fibers that help prevent constipation. Psyllium, which is often added to cereals or used in fiber supplements and laxatives, improves intestinal health and also helps control glucose and cholesterol levels. The processing of packaged foods can remove fiber, so it is important to rely on fresh fruits and vegetables and foods made from whole grains as your main sources of fiber.

Recommended Fiber Intake To reduce the risk of chronic disease and maintain intestinal health, the Food and Nutrition Board recommends a daily fiber intake of 38 grams for adult men and 25 grams for adult women. Americans currently consume about half this amount. Fiber should come from foods, not supplements, which should be used only under medical supervision.

Even though we don't digest fiber, it is necessary for good health.

Vitamins—Organic Micronutrients

Vitamins are organic (carbon-containing) substances required in small amounts to regulate various processes within living cells (Table 12.4). Humans need 13 vitamins; of these, 4 are fat-soluble (A, D, E, and K), and 9 are water-soluble (C, and the B-complex vitamins thiamin, riboflavin, niacin, vitamin B-6, folate, vitamin B-12, biotin, and pantothenic acid).

Solubility affects how a vitamin is absorbed, transported, and stored in the body. The water-soluble vitamins are absorbed directly into the bloodstream, where they travel freely; excess water-soluble vitamins are detected and removed by the kidneys and excreted in urine. Fat-soluble vitamins require

a more complex absorptive process; they are usually carried in the blood by special proteins and are stored in the liver and in fat tissues rather than excreted.

Functions of Vitamins Many vitamins help chemical reactions take place. They provide no energy to the body directly but help unleash the energy stored in carbohydrates, proteins, and fats. Other vitamins are critical in the production of red blood cells and the maintenance of the nervous, skeletal, and immune systems. Some vitamins act as **antioxidants**, which help preserve the health of cells. Key vitamin antioxidants include vitamin E, vitamin C, and the vitamin A precursor beta-carotene. (Antioxidants are described later in the chapter.)

Sources of Vitamins The human body does not manufacture most of the vitamins it requires and must obtain them from foods. Vitamins are abundant in fruits, vegetables, and grains. In addition, many processed foods, such as flour and breakfast cereals, contain added vitamins. A few vitamins are made in certain parts of the body: the skin makes vitamin D when it is exposed to sunlight, and intestinal bacteria make vitamin K. Nonetheless, we still need vitamin D and vitamin K from foods. Table 12.4 lists good food sources of vitamins.

Vitamin Deficiencies If your diet lacks a particular vitamin, characteristic symptoms of deficiency can develop. (Table 12.4 lists the signs of certain vitamin deficiencies.) Physicians have known about some common deficiency-related ailments for generations. For example, *scurvy* is a potentially fatal illness caused by a long-term lack of vitamin C. Children who do not get enough vitamin D can develop *rickets*, which leads to potentially disabling bone deformations. Vitamin A deficiency may cause blindness, and anemia can develop in people whose diet lacks vitamin B-12. Low intake of folate and vitamins B-6 and B-12 has been linked to an increased risk of heart disease.

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total fiber The total amount of dietary fiber and functional fiber in the diet.

soluble (viscous) fiber Fiber that dissolves in water or is broken down by bacteria in the large intestine.

insoluble fiber Fiber that does not dissolve in water and is not broken down by bacteria in the large intestine.

vitamins Carbon-containing substances needed in small amounts to help promote and regulate chemical reactions and processes in the body.

antioxidant A substance that can reduce the breakdown of food or body constituents by free radicals; the actions of antioxidants include binding oxygen, donating electrons to free radicals, and repairing damage to molecules.

Table 12.4**Facts about Vitamins**

VITAMIN	IMPORTANT DIETARY SOURCES	MAJOR FUNCTIONS	SIGNS OF PROLONGED DEFICIENCY	TOXIC EFFECTS OF MEGADOSES
Fat-soluble				
Vitamin A	Liver, milk, butter, cheese, fortified margarine, carrots, spinach, orange and deep-green vegetables and fruits	Immune function and maintenance of vision, skin, linings of the nose, mouth, digestive and urinary tracts	Night blindness, scaling skin, increased susceptibility to infection, loss of appetite, anemia, kidney stones	Liver damage, miscarriage, birth defects, headache, vomiting, diarrhea, vertigo, double vision, bone abnormalities
Vitamin D	Fortified milk and margarine, fish oils, butter, egg yolks (sunlight on skin also produces vitamin D)	Development and maintenance of bones and teeth, promotion of calcium absorption	Rickets (bone deformities) in children; bone softening, loss, and fractures in adults	Kidney damage, calcium deposits in soft tissues, depression, death
Vitamin E	Vegetable oils, whole grains, nuts and seeds, green leafy vegetables, asparagus, peaches	Protection and maintenance of cellular membranes	Red blood cell breakage and anemia, weakness, neurological problems, muscle cramps	Relatively nontoxic, but may cause excess bleeding or formation of blood clots
Vitamin K	Green leafy vegetables; smaller amounts widespread in other foods	Production of factors essential for blood clotting and bone metabolism	Hemorrhaging	None reported
Water-soluble				
Biotin	Cereals, yeast, egg yolks, soy flour, liver; widespread in foods	Synthesis of fat, glycogen, and amino acids	Rash, nausea, vomiting, weight loss, depression, fatigue, hair loss	None reported
Folate	Green leafy vegetables, yeast, oranges, whole grains, legumes, liver	Amino acid metabolism, synthesis of RNA and DNA, new cell synthesis	Anemia, weakness, fatigue, irritability, shortness of breath, swollen tongue	Masking of vitamin B-12 deficiency
Niacin	Eggs, poultry, fish, milk, whole grains, nuts, enriched breads and cereals, meats, legumes	Conversion of carbohydrates, fats, and protein into usable forms of energy	Pellagra (symptoms include diarrhea, dermatitis, inflammation of mucous membranes, dementia)	Flushing of the skin, nausea, vomiting, diarrhea, liver dysfunction, glucose intolerance
Pantothenic acid	Animal foods, whole grains, broccoli, potatoes; widespread in foods	Metabolism of fats, carbohydrates, and proteins	Fatigue, numbness and tingling of hands and feet, gastrointestinal disturbances	None reported
Riboflavin	Dairy products, enriched breads and cereals, lean meats, poultry, fish, green vegetables	Energy metabolism, maintenance of skin, mucous membranes, and nervous system structures	Cracks at corners of mouth, sore throat, skin rash, hypersensitivity to light, purple tongue	None reported
Thiamin	Whole-grain and enriched breads and cereals, organ meats, lean pork, nuts, legumes	Conversion of carbohydrates into usable forms of energy, maintenance of appetite and nervous system function	Beriberi (symptoms include muscle wasting, mental confusion, anorexia, enlarged heart, nerve changes)	None reported
Vitamin B-6	Eggs, poultry, fish, whole grains, nuts, soybeans, liver, kidney, pork	Metabolism of amino acids and glycogen	Anemia, convulsions, cracks at corners of mouth, dermatitis, nausea, confusion	Neurological abnormalities and damage
Vitamin B-12	Meat, fish, poultry, fortified cereals	Synthesis of blood cells, other metabolic reactions	Anemia, fatigue, nervous system damage, sore tongue	None reported
Vitamin C	Peppers, broccoli, spinach, brussels sprouts, citrus fruits, strawberries, tomatoes, potatoes, cabbage, other fruits and vegetables	Maintenance and repair of connective tissue, bones, teeth, and cartilage; promotion of healing; absorption of iron	Scurvy, anemia, reduced resistance to infection, loosened teeth, joint pain, poor wound healing, hair loss, poor iron absorption	Urinary stones in some people, acid stomach from ingesting supplements in pill form, nausea, diarrhea, headache, fatigue

SOURCES: Food and Nutrition Board, Institute of Medicine. 2006. *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, DC: The National Academies Press. Available online at http://www.nap.edu/openbook.php?record_id=11537&page1; Shils, M. E., et al., eds. 2005. *Modern Nutrition in Health and Disease*, 10th ed. Baltimore: Lippincott Williams & Wilkins.

New research is tying vitamin deficiencies with other health risks, as well. For example, experts once thought that vitamin D was the only vitamin that played a role in bone health. Now scientists know that vitamins C and K, as well as several B vitamins, are also important in the prevention of osteoporosis. A great deal of recent research has focused on vitamin D, with surprising results. A systematic review of 17 studies suggests that vitamin D supplementation can reduce the risk of cardiovascular disease. Other studies also link low vitamin D levels to an increased risk of several cancers.

Vitamin deficiency diseases are most often seen in developing countries; they are relatively rare in the United States because vitamins are readily available from our food supply. Still, many Americans consume lower-than-recommended amounts of several vitamins. Even in the face of new findings, however, experts warn that there is not yet enough evidence to suggest that everyone should begin taking vitamin supplements. Supplementation is discussed in detail later in this chapter.

Vitamin Excesses Extra vitamins in the diet can also be harmful, especially when taken as supplements. Megadoses of fat-soluble vitamins are particularly dangerous because the excess is stored in the body rather than excreted, increasing the risk of toxicity. Even when vitamins are not taken in excess, relying on supplements for an adequate intake of vitamins can be a problem. There are many substances in foods other than vitamins and minerals, and some of these compounds may have important health effects. Later this chapter discusses specific recommendations for vitamin intake and when a vitamin supplement is advisable. For now, keep in mind that it's best to get most of your vitamins from foods rather than supplements.

Keeping the Nutrient Value in Food Vitamins and minerals can be lost or destroyed during the storage and cooking of foods. To retain nutrients, eat or process vegetables as soon as possible after purchasing. Store fruits and vegetables in the refrigerator in covered containers or plastic bags to minimize moisture loss. Freeze foods that won't be eaten within a few days. Frozen and canned vegetables are usually as high in nutrients as fresh vegetables because nutrients are locked in when produce is frozen or canned. To reduce nutrient losses during food preparation, minimize the amount of water used and the total cooking time. Baking, steaming, broiling, grilling, and microwaving are all good methods of preparing vegetables.

Minerals—Inorganic Micronutrients

Minerals are inorganic (non-carbon-containing) elements you need in relatively small amounts to help regulate body functions, aid in the growth and maintenance of body tissues, and help release energy (Table 12.5). There are about 17 essential

minerals. The major minerals, which the body needs in amounts exceeding 100 milligrams per day, include calcium, phosphorus, magnesium, sodium, potassium, and chloride. The essential trace minerals, which you need in minute amounts, include copper, fluoride, iodide, iron, selenium, and zinc.

Characteristic symptoms develop if an essential mineral is consumed in a quantity too small or too large for good health. The minerals commonly lacking in the American diet are iron, calcium, potassium, and magnesium. Iron-deficiency **anemia** is a problem in many age groups, and researchers fear that poor calcium intakes in childhood are sowing the seeds for future **osteoporosis**, especially in women. See Chapter 22 for more information about osteoporosis; in this chapter, the box “Eating for Healthy Bones” has tips for building and maintaining bone density.

Water—Vital but Often Ignored

Water is the major component in both foods and the human body: we are composed of about 50–60% water. Our need for other nutrients, in terms of weight, is much less than our need for water. We can live up to 50 days without food but only a few days without water.

Water is distributed all over the body, among lean and other tissues and in blood and other body fluids. Water is used in the digestion and absorption of food and is the medium in which most of the chemical reactions take place within the body. Some water-based fluids, like blood, transport substances around the body, whereas other fluids serve as lubricants or cushions. Water also helps regulate body temperature.

Water is contained in almost all foods, particularly in liquids, fruits, and vegetables.

The foods and beverages you consume provide 80–90% of your daily water intake; the remainder is generated through metabolism. You lose water each day in urine, feces, and sweat and through evaporation from your lungs.

Most people can maintain a healthy water balance by consuming beverages at meals and drinking fluids in response to thirst. The Food and Nutrition Board has set levels of adequate water intake to maintain hydration. All fluids, including those containing caffeine, can count toward your total daily fluid intake. Under these guidelines, men need about 3.7 total liters of water daily, with 3.0 liters (about 13 cups) coming

QUICK STATS

An estimated 10 million Americans have osteoporosis, and 34 million more are at risk due to low bone mass.

—National Osteoporosis Foundation, 2012

TERMS

minerals Inorganic compounds needed in relatively small amounts for regulation, growth, and maintenance of body tissues and functions.

anemia A deficiency in the oxygen-carrying material in the red blood cells.

osteoporosis A condition in which the bones become thin and brittle over time and break easily; due largely to insufficient calcium intake.

Table 12.5 Facts about Selected Minerals

MINERAL	IMPORTANT DIETARY SOURCES	MAJOR FUNCTIONS	SIGNS OF PROLONGED DEFICIENCY	TOXIC EFFECTS OF MEGADOSES
Calcium	Milk and milk products, tofu, fortified orange juice and bread, green leafy vegetables, bones in fish	Formation of bones and teeth, control of nerve impulses, muscle contraction, blood clotting	Stunted growth in children, bone mineral loss in adults, urinary stones	Kidney stones, calcium deposits in soft tissues, inhibition of mineral absorption, constipation
Fluoride	Fluoridated water, tea, marine fish eaten with bones	Maintenance of tooth and bone structure	Higher frequency of tooth decay	Increased bone density, mottling of teeth, impaired kidney function
Iodine	Iodized salt, seafood, processed foods	Essential part of thyroid hormones, regulation of body metabolism	Goiter (enlarged thyroid), cretinism (birth defect)	Depression of thyroid activity, hyperthyroidism in susceptible people
Iron	Meat and poultry, fortified grain products, dark green vegetables, dried fruit	Component of hemoglobin, myoglobin, and enzymes	Iron-deficiency anemia, weakness, impaired immune function, gastrointestinal distress	Nausea, diarrhea, liver and kidney damage, joint pains, sterility, disruption of cardiac function, death
Magnesium	Widespread in foods and water (except soft water); especially found in grains, legumes, nuts, seeds, green vegetables, milk	Transmission of nerve impulses, energy transfer, activation of many enzymes	Neurological disturbances, cardiovascular problems, kidney disorders, nausea, growth failure in children	Nausea, vomiting, diarrhea, central nervous system depression, coma; death in people with impaired kidney function
Phosphorus	Present in nearly all foods, especially milk, cereal, peas, eggs, meat	Bone growth and maintenance, energy transfer in cells	Impaired growth, weakness, kidney disorders, cardiorespiratory and nervous system dysfunction	Drop in blood calcium levels, calcium deposits in soft tissues, bone loss
Potassium	Meats, milk, fruits, vegetables, grains, legumes	Nerve function and body water balance	Muscular weakness, nausea, drowsiness, paralysis, confusion, disruption of cardiac rhythm	Cardiac arrest
Selenium	Seafood, meat, eggs, whole grains	Defense against oxidative stress, regulation of thyroid hormone action	Muscle pain and weakness, heart disorders	Hair and nail loss, nausea and vomiting, weakness, irritability
Sodium	Salt, soy sauce, salted foods, tomato juice	Body water balance, acid-base balance, nerve function	Muscle weakness, loss of appetite, nausea, vomiting; deficiency is rarely seen	Edema (excess fluid buildup), hypertension in sensitive people
Zinc	Whole grains, meat, eggs, liver, seafood (especially oysters)	Synthesis of proteins, RNA, and DNA; wound healing; immune response; ability to taste	Growth failure, loss of appetite, impaired taste acuity, skin rash, impaired immune function, poor wound healing	Vomiting, impaired immune function, decline in blood HDL levels, impaired copper absorption

SOURCES: Food and Nutrition Board, Institute of Medicine. 2006. *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, DC: The National Academies Press. Available online at http://www.nap.edu/openbook.php?record_id=11537&page1; Shils, M. E., et al., eds. 2005. *Modern Nutrition in Health and Disease*, 10th ed. Baltimore: Lippincott Williams & Wilkins.

from beverages; women need 2.7 total liters, with 2.2 liters (about 9 cups) coming from beverages. (See Table 1 in the Nutrition Resources section at the end of the chapter for information about specific age groups.) If you exercise vigorously or live in a hot climate, you need to consume additional fluids to maintain a balance between water consumed and water lost. Severe dehydration causes weakness and can lead to death.

Other Substances in Food

Many substances in food are not essential nutrients but may influence health.

Antioxidants When the body uses oxygen or breaks down certain fats or proteins as a normal part of metabolism, it gives rise to substances called **free radicals**. Environmental factors such as cigarette smoke, exhaust fumes, radiation, excessive sunlight, certain drugs, and stress can increase free

free radical An electron-seeking compound that can react with fats, proteins, and DNA, damaging cell membranes and mutating genes in its search for electrons; produced through chemical reactions in the body and by exposure to environmental factors such as sunlight and tobacco smoke.

TERMS



TAKE CHARGE

Eating for Healthy Bones

Osteoporosis is a condition in which the bones become dangerously thin and fragile over time. An estimated 10 million Americans over age 50 have osteoporosis, and another 34 million are at risk. Women account for about 80% of osteoporosis cases.

Most of our adult bone mass is built by age

18 in girls and age 20 in boys. After bone density peaks between ages 25 and 35, bone mass is lost over time. To prevent osteoporosis, the best strategy is to build as much bone as possible during your youth and do everything you can to maintain it as you age. Up to 50% of bone loss is determined by controllable lifestyle factors. Key nutrients for bone health include the following:

- **Calcium.** Getting enough calcium is important throughout life to build and maintain bone mass. Milk, yogurt, and calcium-fortified orange juice, bread, and cereals are all good sources.
- **Vitamin D.** Vitamin D is necessary for bones to absorb calcium; a daily intake of 600 IU is recommended for individuals aged 1–70. Vitamin D can be obtained from foods and is manufactured by the skin when exposed to sunlight. Candidates for vitamin D supplements include people who don't eat many foods rich in vitamin D; those who don't expose their faces, arms, and hands to the sun (without sunscreen) for 5–15 minutes a few times each week; and people who live north of an imaginary line

roughly between Boston and the Oregon–California border (where the sun is weaker).

- **Vitamin K.** Vitamin K promotes the synthesis of proteins that help keep bones strong. Broccoli and leafy green vegetables are rich in vitamin K.
- **Other nutrients.** Other nutrients that may play an important role in bone health include vitamin C, magnesium, potassium, phosphorus, fluoride, manganese, zinc, copper, and boron.

Several dietary substances may have a *negative* effect on bone health, especially if consumed in excess. These include alcohol, sodium, caffeine, and retinol (a form of vitamin A). Drinking lots of soda, which often replaces milk in the diet, has been shown to increase the risk of bone fractures in teenage girls.

The effect of protein intake on bone mass depends on other nutrients. Protein helps build bone as long as calcium and vitamin D intake are adequate. But if intake of calcium and vitamin D is low, high protein intake can lead to bone loss.

Weight-bearing aerobic exercise helps maintain bone mass throughout life, and strength training improves bone density, muscle mass, strength, and balance. Drinking alcohol only in moderation, refraining from smoking, and managing depression and stress are also important for maintaining strong bones. For people who develop osteoporosis, a variety of medications are available to treat the condition.

radical production. A free radical is a chemically unstable molecule that reacts with fats, proteins, and DNA, damaging cell membranes and mutating genes. Free radicals have been implicated in aging, cancer, cardiovascular disease, and other degenerative diseases like arthritis.

Antioxidants found in foods can help protect the body from damage by free radicals in several ways. Some prevent or reduce the formation of free radicals; others remove free radicals from the body; still others repair some types of free radical damage after it occurs. Some antioxidants, such as vitamin C, vitamin E, and selenium, are also essential nutrients. Others—such as the carotenoids found in yellow, orange, and deep-green vegetables—

are not. Some of the top antioxidant-containing foods and beverages include blackberries, walnuts, strawberries, artichokes, cranberries, brewed coffee, raspberries, pecans, blueberries, cloves, grape juice, unsweetened baking chocolate, sour cherries, and red wine. Also high in antioxidants are brussels sprouts, kale, cauliflower, and pomegranates.

Phytochemicals Antioxidants fall into the broader category of **phytochemicals**, which are substances found in plant foods that may help prevent chronic disease. In just the past 30 years, researchers have identified and studied hundreds of different compounds found in foods, and many findings are promising. For example, certain substances found in soy foods may help lower cholesterol levels. Sulforaphane, a compound isolated from broccoli and other **cruciferous vegetables**, may

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Experts say that two of the most important factors in a healthy diet are eating the “right” kinds of carbohydrates and eating the “right” kinds of fats. Based on what you’ve read so far in this chapter, which are the “right” carbohydrates and fats? How would you say your own diet stacks up when it comes to carbs and fats?



phytochemical A naturally occurring substance found in plant foods that may help prevent and treat chronic diseases like cancer and heart disease; *phyto* means plant.

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cruciferous vegetables Vegetables of the cabbage family, including cabbage, broccoli, brussels sprouts, kale, and cauliflower; the flower petals of these plants form the shape of a cross, hence the name.



Berries are rich in antioxidants, vitamins, and dietary fiber.

render some carcinogenic compounds harmless. Allyl sulfides, a group of chemicals found in garlic and onions, appear to boost the activity of immune cells. Carotenoids found in green vegetables may help preserve eyesight with age. Further research on phytochemicals may extend the role of nutrition to the prevention and treatment of many chronic diseases.

If you want to increase your intake of phytochemicals, it is best to eat a variety of fruits, vegetables, and grains rather than relying on supplements. Like many vitamins and minerals, isolated phytochemicals may be harmful if taken in high doses. In many cases, their health benefits could be the result of many chemical substances working in combination. The role of phytochemicals in disease prevention is discussed further in Chapters 15 and 16.

NUTRITIONAL GUIDELINES: PLANNING YOUR DIET

Scientific and government groups have created a variety of tools to help people design healthy diets:

- The **Dietary Reference Intakes (DRIs)** are standards for nutrient intake designed to prevent nutritional deficiencies and reduce the risk of chronic diseases.
- The **Dietary Guidelines for Americans** were established to promote health and reduce the risk of major chronic diseases through diet and physical activity.
- **MyPlate (formerly MyPyramid)** provides a food guidance system to help people apply the Dietary Guidelines for Americans to their own diets.

Dietary Reference Intakes (DRIs)

The Food and Nutrition Board establishes dietary standards, or recommended intake levels, for Americans of all ages. The current set of standards, called Dietary Reference Intakes (DRIs), was introduced in 1997. The DRIs are frequently reviewed and are updated as substantial new nutrition-related information becomes available. The DRIs present different categories of nutrients in easy-to-read table format. The DRIs have a broad focus, being based on research that looks not just at the prevention of nutrient deficiencies but also at the role of nutrients in promoting health and preventing chronic diseases such as cancer, osteoporosis, and heart disease.

The DRIs include a set of four reference values used as standards for both recommended intakes and maximum safe intakes. The recommended intake of each nutrient is expressed as either *Recommended Dietary Allowance (RDA)* or *Adequate Intake (AI)*. An AI is set when there is not enough information available to set an RDA value; regardless of the type of standard used, however, the DRI represents the best available estimate of intake for optimal health. Used primarily in nutrition policy and research, the *Estimated Average Requirement (EAR)* is the average daily nutrient intake level estimated to meet the requirement of half the healthy individuals in a given gender and life stage. The *Tolerable Upper Intake Level (UL)* is the maximum daily intake that is unlikely to cause health problems in a healthy person. For example, the RDA for calcium for an 18-year-old female is 1300 mg per day; the UL is 3000 mg per day.

Because of lack of data, ULs have not been set for all nutrients. This does not mean that people can tolerate chronic intakes of these vitamins and minerals above recommended levels. Like all chemical agents, nutrients can produce adverse effects if intakes are excessive. There is no established benefit from consuming nutrients at levels above the RDA or AI. The DRIs can be found in the “Nutrition Resources” section at the end of the chapter.

TERMS

Dietary Reference Intakes (DRIs) An umbrella term for four types of nutrient standards designed to prevent nutritional deficiencies and reduce the risk of chronic diseases. Estimated Average Requirement (EAR) is the amount estimated to meet the nutrient needs of half the individuals in a population group; Adequate Intake (AI) and Recommended Dietary Allowance (RDA) are levels of intake considered adequate to prevent nutrient deficiencies and reduce the risk of chronic disease for most individuals in a population group; Tolerable Upper Intake Level (UL) is the maximum daily intake that is unlikely to cause health problems.

Dietary Guidelines for Americans National nutritional recommendations issued jointly by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services every five years; designed to promote health and reduce the risk of chronic diseases.

MyPlate The USDA food guidance system designed to help Americans make healthy food choices.

Because the DRIs are too cumbersome to use as a basis for food labels, the U.S. Food and Drug Administration (FDA) uses another set of dietary standards, the **Daily Values**. The Daily Values are based on several different sets of guidelines and include standards for fat, cholesterol, carbohydrate, dietary fiber, and selected vitamins and minerals. The Daily Values represent appropriate intake levels for a 2000-calorie diet. The percentage Daily Value shown on a food label shows how well that food contributes to your recommended daily intake, assuming you follow a 2000-calorie-per-day diet. Food labels are described in detail later in the chapter.

Dietary Guidelines for Americans

To provide general guidance for choosing a healthy diet, the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (DHHS) issue the Dietary Guidelines for Americans, revising them every five years. These guidelines are intended for all healthy Americans, including children aged 2 and older.

Following these guidelines promotes health and reduces risk of chronic disease, including heart disease, cancer, diabetes, stroke, osteoporosis, and obesity. Each of the guidelines is supported by an extensive review of scientific and medical evidence.

The 2010 Dietary Guidelines are designed to help Americans make healthy and informed food choices. The main objective of the 2010 report is to encourage improved nutrition and physical activity in the American population, two-thirds of whom are overweight or obese and yet undernourished in several key nutrients. It focuses on the total diet and how to integrate the recommendations into a practical eating pattern that is nutrient-dense and calorie-balanced. And it includes findings on the broad environmental and societal aspects of the American diet—that is, the “food environment.”

The 2010 Dietary Guidelines point out the large discrepancy between the recommendations and the actual American diet, which includes too few vegetables, fruits, high-fiber whole grains, low-fat milk and milk products, and seafood and too much added sugar, solid fat, refined grains, and sodium. A variety of dietary patterns can help Americans meet the recommendations.

Two-thirds of Americans are overweight or obese, yet many are undernourished in several key nutrients.

The environment affects both sides of the calorie balance equation—promoting overconsumption of calories and discouraging calorie expenditure in the form of physical activity.

Daily Values A simplified version of the RDAs used on food labels; also included are values for nutrients with no RDA per se.

TERMS

General Guidelines The Dietary Guidelines present two overarching recommendations:

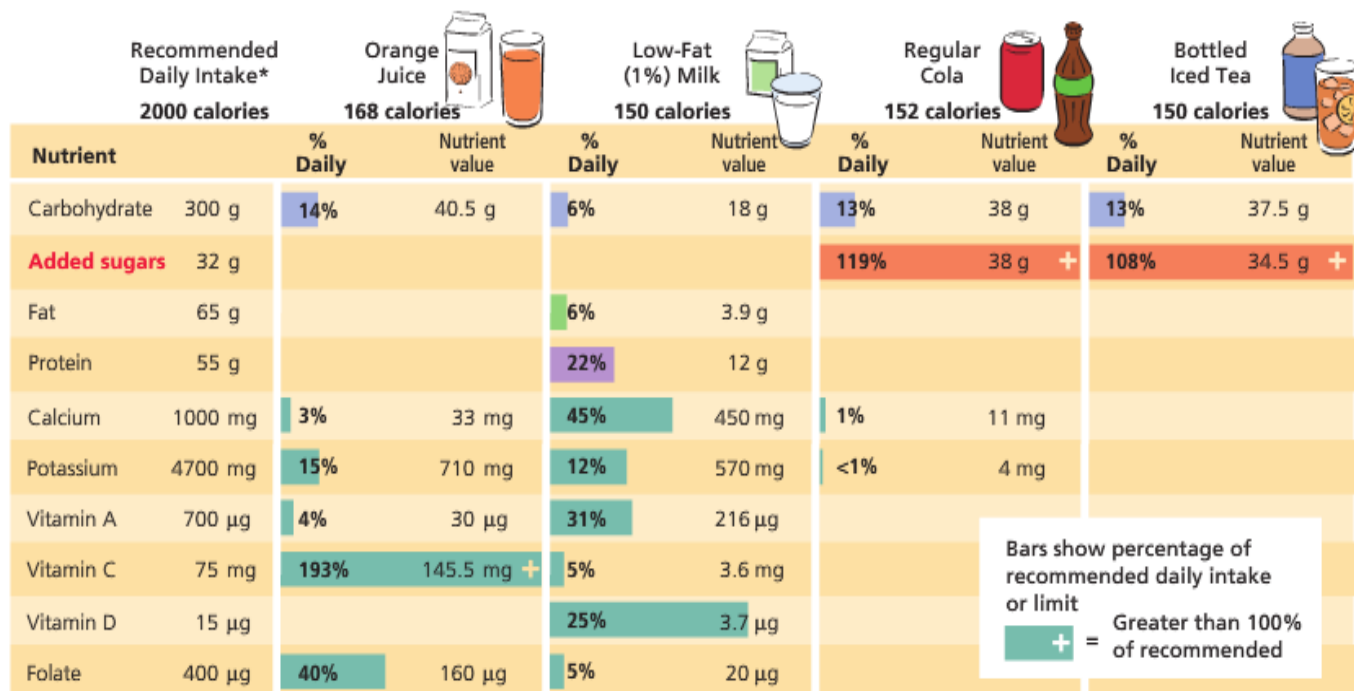
- *Maintain calorie balance over time to achieve and sustain a healthy weight.*
- *Focus on consuming nutrient-dense foods and beverages.*

The report acknowledges the challenges that make it difficult for Americans to reach their food and fitness goals, and it calls for a coordinated strategic plan that includes all sectors of society, from families to food producers and restaurants to policymakers. According to the report, adopting a healthy eating pattern and the recommendations in the Dietary Guidelines for Americans in their entirety will go a long way toward improving health and reducing the risk of chronic disease in every life stage. The Dietary Guidelines for Americans 2010 highlight several key areas—balancing calories to manage weight, reducing certain dietary components, increasing other dietary components, building healthy eating patterns, and making healthy choices in the context of the current food and physical activity environment. Specific recommendations for putting the Dietary Guidelines into practice are provided in MyPlate (discussed in the next section).

Balancing Calories to Manage Weight Calorie balance—the balance between calories consumed and calories expended—is the key to weight management. Current high rates of overweight and obesity can be attributed at least in part to people consuming more calories in foods and beverages than they expend in physical activity. In other words, many Americans are overweight because they are in calorie imbalance. Americans regardless of age are encouraged to achieve and maintain a healthy body weight by balancing the calories they consume with the calories they expend.

The guidelines recognize that many aspects of American life promote obesity, leading to an “obesogenic food environment.” The environment affects both sides of the calorie balance equation—promoting overconsumption of calories and discouraging calorie expenditure in the form of physical activity. Factors contributing to this environment include an increase in the number of fast-food restaurants in communities, an increase in meals eaten outside the home, increased portion sizes, sedentary work and home environments, limited availability of safe outdoor walking and recreational spaces, and increased dependence on transportation and technological advances that lead to lower calorie expenditure on everyday tasks.

Still, managing body weight means that individuals need to carefully consider their total calorie intake, and for people who



*Recommended intakes and limits appropriate for a 20-year-old woman consuming 2000 calories per day.

FIGURE 12.3 Nutrient density of 12-ounce portions of selected beverages.

are overweight or obese, this means consuming fewer calories from foods and beverages. The guidelines encourage people to become more conscious of what, when, why, and how much they eat; to deliberately make better choices; to seek ways to be more physically active, striving to meet the recommendations in the 2008 Physical Activity Guidelines for Americans; and to maintain a healthy weight at all stages of life. The guidelines also urge people to cook at home more and eat out less, to eat smaller portions, to limit screen time, and not to eat while watching TV.

Foods and Food Components to Reduce In addition to overall calories, Americans tend to eat certain foods and food components in excess—in particular, sodium, solid fats, added sugars, and refined grains. Foods high in these items often replace foods with needed nutrients in the diet. Key recommendations include the following:

- Reduce daily sodium intake to less than 2,300 milligrams (mg) and further reduce intake to 1,500 mg if you are 51 or older, are African American, or have hypertension, diabetes, or chronic kidney disease. The 1500 mg recommendation applies to about half the U.S. population, including children and the majority of adults. The average sodium intake for all Americans is estimated at 3400 mg; for boys and men between the ages of 12 and 50, it is estimated at more than 4000 mg. High sodium intake is associated with high blood pressure. Most salt in the diet comes from salt added during food processing.
- Limit intake of saturated fats, trans fats, and dietary cholesterol. Consume less than 10% of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids. Keep trans fatty acid consumption as

low as possible, especially by limiting foods that contain synthetic sources of trans fats, such as partially hydrogenated oils. Consume less than 300 mg per day of dietary cholesterol.

- Reduce the intake of calories from solid fats and added sugars. Together, solid fats and added sugars contribute about 35% of the calories consumed by Americans without contributing many nutrients (Figure 12.3). Most people should consume no more than 5–15% of daily calories from foods in these categories. Sodas, energy drinks, and sports drinks are the biggest source of added sugars in the American diet.
- Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.
- If alcohol is consumed, it should be consumed in moderation—up to one drink per day for women and two drinks per day for men—and only by adults of legal drinking age.

Foods and Nutrients to Increase In general, Americans don't eat a wide enough variety of nutrient-dense foods to obtain all the nutrients they need in the amounts for optimal health. Recommendations include these:

- Eat more fruits and vegetables, and eat a variety of vegetables, especially dark-green, red, and orange vegetables and beans and peas.
- Consume at least half of all grains as whole grains, which are a source of iron, B vitamins, and dietary fiber. Increase whole-grain intake by replacing refined grains with whole grains.
- Increase intake of fat-free or low-fat milk and milk products, such as milk, yogurt, cheese, or fortified soy beverages.

They are important sources of calcium, potassium, magnesium, vitamin D, and vitamin A. Milk and yogurt are preferable to cheese.

- Choose a variety of protein foods, including seafood, lean meat and poultry, eggs, beans and peas, soy products, and unsalted nuts and seeds. Increase the amount and variety of seafood, and reduce protein foods that are high in solid fats and calories. In addition to protein, these foods provide B vitamins, vitamin E, zinc, and magnesium. Seafood provides omega-3 fatty acids, which are associated with reduced risk of heart disease.
- Use oils to replace solid fats where possible.
- Choose foods that provide more potassium, dietary fiber, calcium, and vitamin D, which are nutrients of concern in American diets. These foods include vegetables, fruits, whole grains, and milk and milk products.
- Other nutrients are a concern for certain specific population groups, such as folic acid and iron for women who are pregnant or may become pregnant and vitamin B-12 for adults aged 50 or older.

Building Healthy Eating Patterns There are many different ways to incorporate the individual recommendations of the 2010 Dietary Guidelines into healthy eating patterns that (1) meet nutrient needs; (2) stay within calorie limits; (3) accommodate cultural, ethnic, traditional, and personal preferences; and (4) take into account food cost and availability. In other words, people can eat healthfully in many different ways. (For tips on eating healthfully in a variety of ethnic restaurants, see the box “Ethnic Foods.”)

Three eating plans that show how to put the Dietary Guidelines recommendations into action are the USDA Food Patterns, vegetarian adaptations of the USDA Food Patterns, and the DASH Eating Plan. The USDA Food Patterns and their vegetarian variations were developed to assist people in implementing the Dietary Guidelines. The DASH Eating Plan was developed to help people control high blood pressure. All of these plans emphasize fruits, vegetables, whole grains, beans and peas, fat-free and low-fat milk and milk products, and healthy oils. They include less red meat and more seafood than the typical American diet.

A general principle in all these diets is that people should eat nutrient-dense foods—foods with little or no solid fats and added sugars—so they get all the needed nutrients without exceeding calorie limits. Another principle is that people should get their nutrients from foods rather than from dietary supplements, although supplements or fortification may be helpful for certain populations. The guidelines encourage people to take into account all the foods and beverages they consume, particularly beverages with added sugars, which are a major source of calories.

The USDA Food Patterns set recommended amounts of food to eat from each of five food groups and subgroups at

different calorie levels. They also allow a certain amount of oils, and they limit the number of calories that should be consumed from solid fats and added sugars (SoFAS). You can use the chart shown in Figure 12.4 to find out the recommended intake of foods in each food group at your calorie level. For help determining your calorie level, refer to Table 12.6.

The vegetarian adaptations of the USDA Food Patterns include changes in the protein group and, for vegans, in the dairy group. The vegetarian variations, especially the vegan variation, rely on some fortified foods to ensure that the diet provides all required nutrients, such as calcium and vitamin B-12.

The DASH Eating Plan emphasizes fruits, vegetables, fat-free and low-fat milk and milk products, whole grains, fish, poultry, seeds, and nuts. It has less sodium, fat, and red meat and fewer sweets and added sugars than the typical American diet. The DASH Eating Plan has been shown to help people lower their blood pressure and cholesterol levels, and it is associated with a lower risk of cardiovascular disease. For more details on the DASH Eating Plan, see the Nutrition Resources section at the end of the chapter.

The eating pattern associated with many cultures bordering the Mediterranean Sea and referred to as the Mediterranean diet or the Mediterranean-style eating pattern has many features in common with the USDA Food Patterns and the DASH Eating Plan. It emphasizes fruits and vegetables, nuts, olive oil, and grains, often whole grains, and includes only small amounts of meat and full-fat milk and milk products. The Mediterranean diet has been associated with lower rates of heart disease and lower rate of total mortality.

Helping Americans Make Healthy Choices

A final area covered by the 2010 Dietary Guidelines for Americans is the environment in which people make their food choices. To make healthy choices, individuals need opportunities to obtain healthy foods and engage in physical activity. Significant numbers of Americans—notably members of racial and ethnic minorities, people with disabilities, and people with lower incomes—lack access to affordable, nutritious foods and/or opportunities for safe physical activity in their neighborhoods. The guidelines also recognize the need for *food security* in the United States—defined as the ability to acquire adequate food to meet nutritional needs in a socially acceptable manner. Nearly 15% of the population is not able to obtain sufficient food to meet basic nutritional needs, and as already noted, many more Americans have diets that provide adequate calories but are deficient in essential nutrients.

The Dietary Guidelines propose the Social Ecological Model as a way to understand and address these complex problems. This model considers the interaction among individual factors (such as gender, income, and race/ethnicity), environmental settings (such as schools, workplaces, and restaurants), various sectors of influence (such as health care systems, agriculture, and

QUICK STATS

Soda, energy drinks, and sports drinks contribute almost 36% of added sugars in the diets of Americans aged 2 years and older.

—Dietary Guidelines for Americans, 2010

DIVERSITY MATTERS

Ethnic Foods



No single ethnic diet clearly surpasses all others in providing people with healthful foods. However, every diet has advantages and disadvantages and, within each cuisine, some foods are better choices. The dietary guidance described in this chapter can be applied to any ethnic cuisine. For additional guidance, refer to the table below.

	Choose More Often	Choose Less Often
Chinese	Dishes that are steamed, poached (jum), boiled (chu), roasted (kow), barbecued (shu), or lightly stir-fried Hoisin sauce, oyster sauce, wine sauce, plum sauce, velvet sauce, or hot mustard Fresh fish and seafood, skinless chicken, tofu Mixed vegetables, Chinese greens Steamed rice, steamed spring rolls, soft noodles	Fried wontons or egg rolls Crab rangoon Crispy (Peking) duck or chicken Sweet-and-sour dishes made with breaded and deep-fried meat, poultry, or fish Fried rice Fried or crispy noodles
French	Dishes prepared au vapeur (steamed), en brochette (skewered and broiled), or grillé (grilled) Fresh fish, shrimp, scallops, or mussels or skinless chicken, without sauces Clear soups	Dishes prepared à la crème (in cream sauce), au gratin or gratinée (baked with cream and cheese), or en croûte (in pastry crust) Drawn butter, hollandaise sauce, and remoulade (mayonnaise-based sauce)
Greek	Dishes that are stewed, broiled, or grilled, including shish kebabs (souvlaki) Dolmas (grape leaves) stuffed with rice Tzatziki (yogurt, cucumbers, and garlic) Tabouli (bulgur-based salad) Pita bread, especially whole wheat	Moussaka, saganaki (fried cheese) Vegetable pies such as spanakopita and tyropita Baba ghanoush (eggplant and olive oil) Deep-fried falafel (chickpea patties) Gyros stuffed with ground meat Baklava
Indian	Dishes prepared masala (curry), tandoori (roasted in a clay oven), or tikke (pan roasted); kebabs Raita (yogurt and cucumber salad) and other yogurt-based dishes and sauces Dal (lentils), pullao or pilau (basmati rice) Chapati (baked bread)	Ghee (clarified butter) Korma (meat in cream sauce) Samosas, pakoras (fried dishes) Molee and other coconut milk-based dishes Poori, bhatura, or paratha (fried breads)
Italian	Pasta primavera or pasta, polenta, risotto, or gnocchi with marinara, red or white wine, white or red clam, or light mushroom sauce Dishes that are grilled or prepared cacciatore (tomato-based sauce), marsala (broth and wine sauce), or piccata (lemon sauce) Cioppino (seafood stew) Vegetable soup, minestrone or fagioli (beans)	Antipasto (cheese, smoked meats) Dishes that are prepared alfredo, frito (fried), crema (creamed), alla panna (with cream), or carbonara Veal scaloppini Chicken, veal, or eggplant parmigiana Italian sausage, salami, and prosciutto Buttered garlic bread Cannoli
Japanese	Dishes prepared nabemono (boiled), shabu-shabu (in boiling broth), mushimono (steamed), nimono (simmered), yaki (broiled), or yakimono (grilled) Sushi or domburi (mixed rice dish) Steamed rice or soba (buckwheat), udon (wheat), or rice noodles	Tempura (battered and fried) Agemono (deep fried) Katsu (fried pork cutlet) Sukiyaki Fried tofu
Mexican	Soft corn or wheat tortillas Burritos, fajitas, enchiladas, soft tacos, and tamales filled with beans, vegetables, or lean meats Refried beans, nonfat or low-fat; rice and beans Ceviche (fish marinated in lime juice) Salsa, enchilada sauce, and picante sauce Gazpacho, menudo, or black bean soup Fruit or flan for dessert	Crispy, fried tortillas Dishes that are fried, such as chile rellenos, chimichangas, flautas, and tostadas Nachos and cheese, chili con queso, and other dishes made with cheese or cheese sauce Guacamole, sour cream, and extra cheese Refried beans made with lard Fried ice cream
Thai	Dishes that are barbecued, sautéed, broiled, boiled, steamed, braised, or marinated Sauté (skewered and grilled meats) Fish sauce, basil sauce, chili or hot sauces Bean thread noodles, Thai salad	Coconut milk soup Peanut sauce or dishes topped with nuts Mee-krob (crispy noodles) Red, green, and yellow curries, which typically contain coconut milk

SOURCES: National Heart, Lung and Blood Institute. 2006. *Guidelines on Overweight and Obesity: Electronic Textbook* (http://www.nhlbi.nih.gov/guidelines/obesity/e_txtbk/index.html); Duyff, R. L. 2012. *The American Dietetic Association's Complete Food and Nutrition Guide*, 4th ed. Hoboken, NJ: Wiley.



Daily Amount of Food from Each Group
Food group amounts shown in cups (c) or ounce-equivalents (oz-eq)

Calorie level of pattern	1600	1800	2000	2200	2400	2600	2800	3000
Fruits	1.5 c	1.5 c	2 c	2 c	2 c	2 c	2.5 c	2.5 c
Vegetables	2 c	2.5 c	2.5 c	3 c	3 c	3.5 c	3.5 c	4 c
Dark-green	1.5 c/wk	1.5 c/wk	1.5 c/wk	2 c/wk	2 c/wk	2.5 c/wk	2.5 c/wk	2.5 c/wk
Red and orange	4 c/wk	5.5 c/wk	5.5 c/wk	6 c/wk	6 c/wk	7 c/wk	7 c/wk	7.5 c/wk
Beans and peas (legumes)	1 c/wk	1.5 c/wk	1.5 c/wk	2 c/wk	2 c/wk	2.5 c/wk	2.5 c/wk	3 c/wk
Starchy	4 c/wk	5 c/wk	5 c/wk	6 c/wk	6 c/wk	7 c/wk	7 c/wk	8 c/wk
Other	3.5 c/wk	4 c/wk	4 c/wk	5 c/wk	5 c/wk	5.5 c/wk	5.5 c/wk	7 c/wk
Grains	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq	8 oz-eq	9 oz-eq	10 oz-eq	10 oz-eq
Whole grains	3 oz-eq	3 oz-eq	3 oz-eq	3.5 oz-eq	4 oz-eq	4.5 oz-eq	5 oz-eq	5 oz-eq
Enriched grains	2 oz-eq	3 oz-eq	3 oz-eq	3.5 oz-eq	4 oz-eq	4.5 oz-eq	5 oz-eq	5 oz-eq
Protein foods	5 oz-eq	5 oz-eq	5.5 oz-eq	6 oz-eq	6.5 oz-eq	6.5 oz-eq	7 oz-eq	7 oz-eq
Seafood	8 oz/wk	8 oz/wk	8 oz/wk	9 oz/wk	10 oz/wk	10 oz/wk	11 oz/wk	11 oz/wk
Meat poultry, eggs	24 oz/wk	24 oz/wk	26 oz/wk	29 oz/wk	31 oz/wk	31 oz/wk	34 oz/wk	34 oz/wk
Nuts, seeds, soy products	4 oz/wk	4 oz/wk	4 oz/wk	4 oz/wk	5 oz/wk	5 oz/wk	5 oz/wk	5 oz/wk
Dairy	3 c	3 c	3 c	3 c	3 c	3 c	3 c	3 c
Oils	22 g	24 g	27 g	29 g	31 g	34 g	36 g	44 g
Maximum SoFAS limit, calories (% of calories)	121 (8%)	161 (9%)	258 (13%)	266 (12%)	330 (14%)	362 (14%)	395 (14%)	459 (15%)

FIGURE 12.4 USDA Food Patterns. To determine an appropriate amount of food from each food group, find the column for your estimated daily calorie level. That column shows the recommended daily intake from each group. For a personalized intake plan, visit ChooseMyPlate.gov.

SOURCE: U.S. Department of Agriculture and U.S. Department of Health and Human Services. 2010. *Dietary Guidelines for Americans, 2010*. 7th edition. Washington, DC: U.S. Government Printing Office.

media), and social and cultural norms and values (such as assumptions regarding body weight, types of foods consumed, and amount of physical activity incorporated into one's free time). All these factors play a role in a person's food and physical activity choices—and ultimately in a person's health risks and outcomes.

The guidelines call on all elements of society, ranging from educators to communities to government policymakers, to implement strategies aimed at improving the food and activity environment in the United States. Examples of such strategies are expanding access to grocery stores, farmers' markets, and other sources of healthy food; ensuring that meals and snacks served in schools are consistent with the Dietary Guidelines;

encouraging physical activity in schools; developing policies to limit food and beverage marketing to children; supporting sustainable agricultural practices; and providing nutrition assistance programs. Such measures have the potential to improve the health of current and future generations by making healthy physical activity and eating choices the norm.

USDA's MyPlate

To further help consumers put the Dietary Guidelines for Americans into practice, the USDA also issues the food guidance system known as MyPlate (formerly MyPyramid).



FIGURE 12.5 How to eat for health. Released in 2011, the USDA's MyPlate is designed as a simple graphic to help Americans apply the Dietary Guidelines for Americans to their own diets. MyPlate contains five main food groups and seven key messages for consumers: Enjoy your food, but eat less; avoid oversized portions; make half your plate fruits and vegetables; make at least half your grains whole; switch to fat-free or low-fat (1%) milk; compare the sodium in your foods; drink water instead of sugary drinks.

SOURCE: U.S. Department of Agriculture. 2010. *Choose MyPlate* (<http://www.choosemyplate.gov>).

MyPlate provides a simple graphic showing how to use the five good groups to build a healthy plate at each meal (Figure 12.5). Key messages include the following:

- **Balancing calories:**
 - Enjoy your food, but eat less.
 - Avoid oversized portions.
- **Foods to increase:**
 - Make half your plate fruits and vegetables.
 - Make at least half your grains whole grains.
 - Switch to fat-free or low-fat (1%) milk.
- **Foods to reduce:**
 - Compare sodium in foods like soup, bread, and frozen meals and choose the foods with lower numbers.
 - Drink water instead of sugary drinks.

MyPlate encourages individuals to take advantage of the customization made possible by the Internet. You can get a personalized version of MyPlate recommendations by visiting www.ChooseMyPlate.gov. Using the daily food plan feature, you can determine the amount of each food group you need daily based on your calorie allowance. Your plan is personalized based on your age, gender, weight, height, and level of physical activity. Another feature available at ChooseMyPlate.gov is the SuperTracker, which helps consumers create a personalized food and activity plan, look up and track individual foods, compare food choices to recommendations, and get suggestions and support to make healthier choices. MyPlate is available in Spanish, and there are special recommendations for dieters, preschoolers aged 2–5, children aged 6–11, and pregnant and breastfeeding women.

Each food group is described briefly in the following sections. Many Americans have trouble identifying serving sizes,

so recommended daily intakes from each group are given in terms of cups and ounces; see the box “Judging Portion Sizes” for additional advice.

Whole and Refined Grains Foods from this group are usually low in fat and rich in complex carbohydrates, dietary fiber (if grains are unrefined), and vitamins and minerals, including thiamin, riboflavin, iron, niacin, folic acid (if enriched or fortified), and zinc. A 2000-calorie diet should include 6 ounce-equivalents each day, with half of those servings from whole grains such as whole-grain bread, whole-wheat pasta, high-fiber cereal, or brown rice. The key message for consumers is this: *Make at least half of your grains whole grains.* The following items count as a 1 ounce-equivalent:

- 1 slice of bread
- 1 small (2½-inch diameter) muffin
- 1 cup ready-to-eat cereal flakes
- ½ cup cooked cereal, rice, grains, or pasta
- 1 6-inch tortilla

Choose foods that are typically made with little fat or sugar (bread, rice, pasta) over those that are high in fat and sugar (croissants, chips, cookies).

Vegetables Vegetables contain carbohydrates, dietary fiber, carotenoids, vitamin C, folate, potassium, and other nutrients. They are naturally low in fat. A 2000-calorie diet should include 2½ cups of vegetables daily. The key message for the vegetable group is this: *Make half your plate fruits and vegetables.* Each of the following counts as 1 cup from the vegetable group:

- 1 cup raw or cooked vegetables
- 2 cups raw leafy salad greens
- 1 cup vegetable juice

Because vegetables vary in the nutrients they provide, it is important to eat a variety of vegetables to obtain maximum nutrition. MyPlate recommends weekly servings from five different subgroups within the vegetables group (see Figure 12.4). Try to eat vegetables from several subgroups each day.

Fruits Fruits are rich in carbohydrates, dietary fiber, and many vitamins, especially vitamin C. A 2000-calorie diet should include 2 cups of fruits daily. The key message for the fruit group is this: *Make half your plate fruits and vegetables.* Each of the following counts as 1 cup from the fruit group:

- 1 cup fresh, canned, or frozen fruit
- 1 cup fruit juice (100% juice)
- 1 small whole fruit
- ½ cup dried fruit

Choose whole fruits often; they are higher in fiber and often lower in calories than fruit juices. Fruit *juices* typically contain more nutrients and less added sugar than fruit *drinks*. When buying canned fruits, choose those packed in 100% fruit juice or water rather than in syrup.

Table 12.6**Estimated Daily Calorie Needs**

AGE (YEARS)	SEDENTARY ^a	MODERATELY ACTIVE ^b	ACTIVE ^c
Female			
2–3	1000	1000–1400	1000–1400
4–8	1200–1400	1400–1600	1400–1800
9–13	1400–1600	1600–2000	1800–2200
14–18	1800	2000	2400
19–30	1800–2000	2000–2200	2400
31–50	1800	2000	2200
51+	1600	1800	2000–2200
Male			
2–3	1000–1200	1000–1400	1000–1400
4–8	1400–1600	1400–1600	1600–2000
9–13	1600–2000	1800–2200	2000–2600
14–18	2000–2400	2400–2800	2800–3200
19–30	2400–2600	2600–2800	3000
31–50	2200–2400	2400–2600	2800–3000
51+	2000–2200	2200–2400	2400–2800

^aA lifestyle that includes only the light physical activity associated with typical day-to-day life

^bA lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour (30–60 minutes a day of moderate physical activity), in addition to the light physical activity associated with typical day-to-day life

^cA lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour (60 or more minutes a day of moderate physical activity), in addition to the light physical activity associated with typical day-to-day life

SOURCE: U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2011. *Dietary Guidelines for Americans, 2010* (<http://www.cnpp.usda.gov/publications/dietaryguidelines/2010/policydoc/policydoc.pdf>).

Dairy This group includes milk and milk products, such as yogurt and cheeses that retain their calcium, as well as calcium-fortified soy milk. Foods from this group are high in protein, carbohydrate, calcium, potassium, riboflavin, and vitamin D (if fortified). Dairy choices should be fat-free or low-fat as much as possible to reduce calories and limit saturated fats. The key message for the dairy group is this: *Switch to fat-free or low-fat (1%) milk*. A 2000-calorie diet should include 3 cups of milk or the equivalent daily. Each of the following counts as the equivalent of 1 cup:

- 1 cup milk
- 1 cup yogurt
- ½ cup ricotta cheese
- 1½ ounces natural cheese
- 2 ounces processed cheese

Cottage cheese is lower in calcium than most other cheeses; ½ cup is equivalent to ¼ cup milk. Ice cream is also lower in

calcium and higher in sugar and fat than many other dairy products; one scoop counts as ⅓ cup milk.

Protein Foods This group includes meat, poultry, fish, dried beans and peas, eggs, nuts, and seeds, and processed soy foods. These foods provide protein, niacin, iron, vitamin B-6, zinc, and thiamin. The animal foods in this group also provide vitamin B-12. A 2000-calorie diet should include 5½ ounce-equivalents daily. Each of the following counts as equivalent to 1 ounce:

- 1 ounce cooked lean meat, poultry, or fish
- ¼ cup cooked dried beans (legumes) or tofu
- 1 egg
- 1 tablespoon peanut butter
- ½ ounce nuts or seeds

Choose lean meats and skinless poultry, select a variety of protein foods, and watch serving sizes carefully. Choose at least one serving of plant proteins, such as black beans, lentils, or tofu, every day, and include at least 8 ounces of cooked seafood per week.

Oils Included in this category are oils and fats that are liquid at room temperature; they come mostly from plant and fish sources. Also included are soft margarines, soft vegetable oil table spreads, mayonnaise, and some salad dressings that have no trans fats. These are major sources of vitamin E and unsaturated fatty acids, including essential fatty acids, but they are not a food group. A 2000-calorie diet should include 6 teaspoons (27g) of oils per day. One teaspoon is the equivalent of the following:

- 1 teaspoon vegetable oil or soft margarine
- 1 tablespoon mayonnaise-type salad dressing

Foods that are mostly oils include nuts, olives, avocados, and some fish. The following portions include about 1 teaspoon of oil: 8 large olives, ⅓ medium avocado, ½ tablespoon peanut butter, and ⅓ ounce roasted nuts. Food labels can help you identify the types and amounts of fat in various foods.

Solid Fats and Added Sugars (SoFAs) If you consistently choose nutrient-dense foods that are fat-free or low-fat and that contain no added sugars, you can also have a small amount of additional calories in the form of solid fats and added sugars (SoFAS). Figure 12.4 shows the maximum number of SoFAS calories allowed at each calorie level in MyPlate. The average American consumes nearly 800 calories daily from solid fats and added sugars—far higher than the recommended limits.

People who are trying to lose weight may choose not to ingest SoFAS calories. For those wanting to maintain weight, these calories may be used to increase the amount of food from a food group; to consume foods that contain solid fats or added sugars; or to consume alcohol.

The current American diet includes higher levels of sugar intake and more calories per day from sugar than recommended. In particular, experts advise consumers to

TAKE CHARGE Judging Portion Sizes



Studies have shown that most people underestimate the size of their food portions, in many cases by as much as 50%. If you need to retrain your eye, try using measuring cups and spoons and an inexpensive kitchen scale when you eat at home. With a little practice, you'll learn the difference between 3 and 8 ounces of chicken or meat and what a half-cup of rice really looks like. For quick estimates, use the following equivalents:

- 1 teaspoon of margarine = the tip of your thumb
- 1 ounce of cheese = your thumb, four dice stacked together, or an ice cube
- 3 ounces of chicken or meat = a deck of cards
- 1 cup of pasta = a small fist or a tennis ball

- ½ cup of rice or cooked vegetables = an ice cream scoop or one-third of a can of soda
- 2 tablespoons of peanut butter = a ping-pong ball or a large marshmallow
- 1 medium potato = a computer mouse
- 2-ounce muffin or roll = a plum or a large egg
- 2-ounce bagel = a hockey puck or a yo-yo
- 1 medium fruit (apple or orange) = a baseball
- ¼ cup nuts = a golf ball
- Small cookie or cracker = a poker chip

be wary of products containing high-fructose corn syrup. Although this sweetener is not harmful in itself, it is high in calories and very low in nutritional value. High-fructose corn syrup is found in many products, especially soft drinks and processed foods. Research has linked high consumption of high-fructose corn syrup with obesity, diabetes, and other health problems.

For an evaluation of your diet, complete the activity in the box “Your Diet versus MyPlate Recommendations.”

Physical Activity The Dietary Guidelines for Americans and MyPlate strongly encourage all Americans to be physically active as much as possible. Daily physical activity improves health, reduces the risk of chronic diseases, and helps people manage body weight. The MyPlate recommendation for adults is 2½ hours of moderate physical activity or 1¼ hours of vigorous physical activity per week, equivalent to the 150 minutes of moderate activity or 75 minutes of vigorous activity recommended in the 2008 Physical Activity Guidelines for Americans.

The Vegetarian Alternative

Vegetarians choose a diet with one basic difference from the diets described previously—they restrict or exclude foods of animal origin (meat, poultry, fish, eggs, and milk). Vegetarian diets tend to be lower in total calories and calories from fat, saturated fat, cholesterol, and animal protein while being higher in complex carbohydrates, dietary fiber, potassium, folate, vitamins C and E, carotenoids, and phytochemicals. Individuals who follow a vegetarian diet generally have a lower body mass index than nonvegetarians. Many people adopt a vegetarian diet for health reasons, while others do so

out of concern for the environment, for financial reasons, or for reasons related to ethics or religion.

Types of Vegetarian Diets There are various vegetarian styles. The wider the variety of the diet eaten, the easier it is to meet nutritional needs.

- *Vegans* eat only plant foods.
- *Lacto-vegetarians* eat plant foods and dairy products.
- *Lacto-ovo-vegetarians* eat plant foods, dairy products, and eggs.

Table 12.7

Top Ten Sources of Calories in the American Diet, from the National Health and Nutrition Examination Survey (NHANES), 2005–2006

FOOD	CALORIES PER DAY
Grain-based desserts	138
Yeast breads	129
Chicken and chicken-mixed dishes	121
Soda/energy/sports drinks	114
Pizza	98
Alcoholic beverages	82
Pasta and pasta dishes	81
Mexican mixed dishes	80
Beef and beef mixed dishes	64
Dairy desserts	62

NOTE: For teenagers aged 14–18, the top source of calories is soda/energy/sports drinks, accounting for 226 calories per day.

SOURCE: U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2011. Dietary Guidelines for Americans, 2010 (<http://www.cnpp.usda.gov/publications/dietaryguidelines/2010/policydoc/policydoc.pdf>).

vegetarian Someone who follows a diet that restricts or eliminates foods of animal origin.

TERMS



You can track your diet and physical activity and create a personal diet plan by using the online tools at ChooseMyPlate.gov.

Others can be categorized as partial vegetarians, semivegetarians, or pescovegetarians. These people eat plant foods, dairy products, eggs, and usually a small selection of poultry, fish, and other seafood. Many other people choose vegetarian meals frequently but are not strictly vegetarians. Including some animal protein (such as dairy products) in a vegetarian diet makes planning easier, but it is not necessary.

A Food Plan for Vegetarians Adapting the USDA Food Patterns and MyPlate for vegetarians requires only a few key modifications. For the meat and beans group, vegetarians can focus on the nonmeat choices of dry beans, nuts, seeds, eggs, and soy foods like tofu. Vegans and other vegetarians who do not consume any dairy products must find other rich sources of calcium. Fruits, vegetables, and whole grains are healthy choices for people following all types of vegetarian diets.

A healthy vegetarian diet emphasizes a wide variety of plant foods. Although plant proteins are generally of lower quality than animal proteins, choosing a variety of plant foods will supply all of the essential amino acids. Choosing minimally processed and unrefined foods will maximize nutrient value and provide ample dietary fiber. Daily consumption of a variety of plant foods in amounts that meet total energy needs can provide all needed nutrients, except vitamin B-12 and possibly calcium, iron, zinc, and vitamin D. Strategies for obtaining nutrients of concern include the following:

- **Vitamin B-12** occurs naturally only in animal foods. If dairy products and eggs are limited or avoided, B-12 can be

obtained from fortified foods such as ready-to-eat cereals, soy beverages, meat substitutes, and special yeast products or from supplements.

- **Vitamin D** can be obtained by spending 5–15 minutes a day in the sun (without sunscreen), from vitamin D–fortified products like ready-to-eat cereals, fortified orange juice, and soy or rice milk, or by taking a supplement.
- **Calcium** is found in legumes, tofu processed with calcium, dark green leafy vegetables, nuts, tortillas made from lime-processed corn, and fortified orange juice, soy milk, bread, and other foods.
- **Iron** can be obtained from whole grains, fortified bread and breakfast cereals, dried fruits, green leafy vegetables, nuts and seeds, legumes, and soy foods. The iron in plant foods is more difficult for the body to absorb than is the iron from animal sources; consuming a good source of vitamin C with most meals is helpful because vitamin C improves iron absorption.

- **Zinc** is found in whole grains, nuts, legumes, and soy foods.

If you're a vegetarian, remember that it's especially important to eat as wide a variety of foods as possible to ensure that all your nutritional needs are satisfied. Consulting with a registered dietitian will make your meal planning easier. Vegetarian diets for children, teens, and pregnant and lactating women warrant professional guidance.

QUICK STATS

5% of American adults identify themselves as vegetarians.

—The Vegetarian Resource Group, 2011

ASSESS YOURSELF

Your Diet versus MyPlate Recommendations



1. **Keep a food record:** To evaluate your daily diet, begin by keeping a record of everything you eat on a typical day. To help with your analysis, break down each food item into its component parts and note your portion sizes. For example, you might list a turkey sandwich as 2 slices of sourdough bread, 3 ounces of turkey, 1 tomato, 1 tablespoon of mayonnaise, and so on.
2. **Compare your servings to the recommendations of MyPlate:** Complete the following chart to compare your daily diet to the USDA Food Intake Patterns and MyPlate. See Figure 12.4 for the recommended amount or servings for your calorie level.

Food Group	Recommended Daily Amounts/Servings for Your Energy Intake	Your Actual Daily Intake (Amounts/Servings)	Serving Sizes and Equivalents
Grains (total)			1 ounce-equivalent = 1 slice of bread; 1 small muffin; 1 cup ready-to-eat cereal flakes; or $\frac{1}{2}$ cup cooked cereal, rice, grains, or pasta
Whole grains			
Refined grains			
Vegetables (total)			1 cup or equivalent (1 serving) = 1 cup raw or cooked vegetables; 2 cup raw leafy salad greens; or 1 cup vegetable juice
Dark green*			
Deep yellow*			
Legumes*			
Starchy*			
Other*			
Fruits			1 cup or equivalent (1 serving) = 1 cup fresh, canned, or frozen fruit; 1 cup fruit juice; 1 small whole fruit; or $\frac{1}{2}$ cup dried fruit
Dairy			1 cup or equivalent = 1 cup milk or yogurt; $1\frac{1}{2}$ oz natural cheese; or 2 oz processed cheese
Protein foods			1 ounce-equivalent = 1 oz lean meat, poultry, or fish; $\frac{1}{4}$ cup cooked dry beans or tofu; 1 egg; 1 tablespoon peanut butter; or $\frac{1}{2}$ oz nuts or seeds
Seafood*			
Meat, poultry, eggs*			
Nuts, seeds, soy products*			
Oils			1 teaspoon or equivalent = 1 teaspoon vegetable oil or 1 tablespoon mayonnaise-type salad dressing
Maximum SoFAS			

*Calculate daily intake from the weekly amounts shown in Figure 12.4.

It may be difficult to track values for added sugars, and especially for oils and fats, but be as accurate as you can. Check food labels for information about fat and sugar. (NOTE: For a more complete and accurate analysis of your diet, keep food records for three days and then average the results.) ChooseMyPlate.gov has additional guidelines for counting discretionary calories.

3. **Further evaluate your food choices within the groups:** Based on the data you collected and what you learned in this chapter, what were the especially healthy choices you made (for example, whole grains and citrus fruits), and what were your less healthy choices? Identify and list foods in the latter category because these are areas where you can make changes to improve your diet. In particular, you may want to limit your intake of the following: processed, sweetened grains; high-fat meats and poultry skin; deep-fried fast foods; full-fat dairy products; regular sodas, sweetened teas, and fruit drinks; alcoholic beverages; and other foods that provide primarily sugar and fat and few other nutrients.
4. **Make healthy changes:** Bring your diet in line with MyPlate by adding servings from food groups for which you fall short of the recommendations. To maintain a healthy weight, you may need to balance these additions by making reductions in other areas—by eliminating some of the fats, oils, sweets, and alcohol you consume; by cutting extra servings from food groups for which your intake is more than adequate; or by making healthier choices within the food groups. Make a list of foods to add and a list of foods to eliminate, and post your lists in a prominent location.

For a more detailed and customized analysis of your current diet, including intakes of specific nutrients, use the online SuperTracker tool available at MyPlate.gov.



WELLNESS ON CAMPUS

Eating Strategies for College Students

All the Time

- Eat a colorful, varied diet. The more colorful your diet is, the more varied and rich in fruits and vegetables it will be. Fruits and vegetables are typically inexpensive, delicious, nutritious, and low in fat and calories.
- Eat breakfast. You'll have more energy in the morning and be less likely to grab an unhealthy snack later on.
- Choose healthy snacks—fruits, vegetables, whole grains, and cereals.
- Drink nonfat milk, water, mineral water, or 100% fruit juice more often than soft drinks or sweetened beverages.
- Pay attention to portion sizes.
- Combine physical activity with healthy eating.

Eating in the Dining Hall

- Choose a meal plan that includes breakfast.
- Decide what you want to eat before you get in line, and stick to your choices.
- Build your meals around whole grains and vegetables. Ask for small servings of meat and high-fat main dishes.
- Choose leaner poultry, fish, or bean dishes rather than high-fat meats and fried entrees.
- Ask that gravies and sauces be served on the side; limit your intake.
- Choose broth-based or vegetable soups, not cream soups.
- At the salad bar, load up on leafy greens, beans, and fresh vegetables. Avoid mayonnaise-coated salads, bacon, croutons,

and high-fat dressings. Put dressing on the side, and dip your fork into it rather than pouring it over the salad.

- Choose fruit for dessert rather than baked goods.

Eating in Fast-Food Restaurants

- Most fast-food chains can provide a brochure with the nutritional content of their menu items. Ask for it, or check the restaurant's website for nutritional information. Order small single burgers with no cheese instead of double burgers with many toppings. If possible, get them broiled instead of fried.
- Ask for items to be prepared without mayonnaise, tartar sauce, sour cream, or other high-fat sauces. Ketchup, mustard, and fat-free mayonnaise or sour cream are better choices and are available at many fast-food restaurants.
- Choose whole-grain bread for burgers and sandwiches.
- Choose chicken items made from chicken breast, not processed chicken.
- Order vegetable pizzas without extra cheese.
- Try a salad or fruit as a side item. If you can't resist french fries or onion rings, get the smallest size.

Eating on the Run

- When you need to eat in a hurry, remember that you can carry healthy foods in your backpack or a small insulated lunch sack (with a frozen gel pack to keep fresh food from spoiling).
- Carry items that are small and convenient but nutritious, such as fresh fruits or vegetables, whole-wheat buns or muffins, snack-size cereal boxes, and water.
- When buying beverages from vending machines, choose water or 100% fruit juice. When buying snacks, choose whole-grain crackers, pretzels, nuts or seeds, baked chips, low-fat popcorn, or low-fat granola bars.



Functional Foods

The American diet already contains numerous *functional foods*. Two of the earliest functional foods introduced in the United States were iodized salt and milk fortified with vitamins A and D. More recently, manufacturers began fortifying breads and grains with folic acid to reduce the incidence of neural tube defects.

Although experts suggest that all foods are “functional,” in general, functional foods are defined as foods to which health-promoting or disease-preventing components have been added. They include foods that are fortified, enriched, or enhanced or that contain dietary components with additional potential to benefit health. Some examples of functional foods are calcium-fortified orange juice, margarine enriched with sterols or stanols to lower the risk of heart

disease, sports bars for energy and improved athletic performance, and vitamin B-12-enriched soy milk for vegetarians.

Dietary Challenges for Various Population Groups

The Dietary Guidelines for Americans and MyPlate can help nearly anyone create a healthy diet. However, some population groups face special dietary challenges.

Children and Teenagers Young people often need to be encouraged to eat. Perhaps the best thing a parent can do for younger children is to provide them with a variety of foods. Allowing children to help prepare meals is another good way to increase food variety and develop a child's interest in eating

well. Many children and teenagers enjoy eating at fast-food restaurants, but they should be encouraged to select the healthiest choices from fast-food menus and to balance the day's diet with low-fat, nutrient-rich foods.

College Students Convenient foods are not always the healthiest choices. Students who eat in buffet-style dining halls can easily overeat, and the foods offered are not necessarily high in nutrients or low in fat. The same is true of meals at fast-food restaurants. See the box "Eating Strategies for College Students" for tips on making healthy eating convenient and affordable.

Pregnant and Breastfeeding Women Good nutrition is essential to a healthy pregnancy. Before conception, nutrition counseling can help a woman establish a balanced eating plan and healthy body weight for pregnancy. During pregnancy and while breastfeeding, women have special nutritional needs and are often advised to take a nutrient supplement (discussed in more detail later in this chapter).

Older Adults Nutrient needs do not change much as people age, but because older adults tend to become less active, they don't need as many calories to maintain body weight. At the same time, older adults absorb some nutrients less efficiently because of age-related changes in the digestive tract. For these reasons, older adults should focus on eating nutrient-dense foods. Foods fortified with vitamin B-12 and/or B-12 supplements are recommended for people over age 50, and calcium and vitamin D supplements may be recommended for older adults to reduce bone loss and lower the risk of osteoporosis. Antioxidants from fruits and vegetables are important in older adults to reduce age-related changes in vision and cognitive functioning. Because constipation is a common problem for older adults, eating high-fiber foods and drinking enough fluids are important goals.

Athletes Key dietary concerns for athletes are meeting their increased energy requirements and drinking enough fluids during practice and throughout the day to remain fully hydrated. Endurance athletes and athletes in heavy training may also benefit from increasing the amount of carbohydrate in the diet to 60–70% of total daily calories; this increase should take the form of complex, rather than simple, carbohydrates. Athletes who need to maintain a low body weight—such as skaters, gymnasts, and wrestlers—must avoid unhealthy eating patterns, which can lead to eating disorders. Eating for exercise is discussed in more detail in Chapter 13; see Chapter 14 for information about eating disorders.

People with Special Health Concerns Many Americans have special health concerns that affect their dietary needs. For example, women who are pregnant or breastfeeding require extra calories, vitamins, and minerals (see Chapter 8).

People with diabetes benefit from a well-balanced diet that is low in simple sugars, high in complex carbohydrates, and rich in monounsaturated fats. People with high blood pressure need to control their weight and limit their sodium consumption. If you have a health concern that requires a special diet, discuss your situation with a physician or registered dietitian.

A PERSONAL PLAN: MAKING INFORMED CHOICES ABOUT FOOD

Understanding the basics of good nutrition should get you started on creating a healthy diet that works for you. But eating for health involves other skills, as well. For example, it's helpful to be able to interpret the labels on food products and dietary supplement labels. Everyone who handles and prepares food should know how to avoid foodborne illnesses and environmental contaminants. And in addition to understanding the nutritional content of foods, you can be an even smarter consumer if you know about other food content, such as additives, and the various ways foods can be processed before going to market. The following sections address these issues.

Reading Food Labels

All processed foods regulated by either the FDA or the USDA include standardized nutrition information on their labels. Every food label shows serving sizes and the amounts of fat, saturated fat, trans fat, cholesterol, sodium, total carbohydrate, dietary fiber, sugars, and protein in each serving. To make intelligent choices about food, learn to read and *understand* food labels (see the box "Using Food Labels").

Fresh meat, poultry, fish, fruits, and vegetables are not required to have food labels, and many of these products are not packaged. You can find information about the nutrient content of these items from basic nutrition books, registered dietitians, nutrient analysis computer software, the Internet, and the companies that produce or distribute these foods. Supermarkets may also have large posters or pamphlets listing the nutrient contents of these foods.

Dietary Supplements

All government food guidance systems encourage people to meet their nutritional needs with food rather than with vitamin and mineral supplements. Supplements lack the fiber and potentially beneficial phytochemicals that are found only in whole foods. Most Americans can get the vitamins and minerals they need by eating a nutritionally balanced diet of various foods. The use of supplements to reduce heart disease or cancer risk remains controversial, so experts suggest that you avoid taking any nutrient at a level exceeding the Tolerable Upper Intake Level (UL).

Dietary supplements are not recommended for healthy people, but they can be helpful for people with certain needs.

Although dietary supplements are sold over the counter, that doesn't necessarily mean they are safe. Some vitamins and minerals are dangerous when taken in excess. Large doses of particular nutrients can also cause health problems by affecting the absorption of certain vitamins or minerals or interacting with medications. For this reason, ask your doctor or a dietician before taking any high-dosage supplement.

People Who Benefit from Supplements In setting the DRIs, the Food and Nutrition Board recommended supplements of particular nutrients for specific groups:

- Women who are capable of getting pregnant should get 400 µg per day of folic acid (the synthetic form of the vitamin folate) from fortified foods and/or supplements in addition to folate from a varied diet. This level of folate can reduce the risk of neural tube defects in a developing fetus. Enriched breads, flours, cornmeal, rice, noodles, and other grain products are fortified with folic acid. Folate is found naturally in leafy green vegetables, legumes, oranges, and strawberries.
- As noted earlier, people over age 50 should eat foods fortified with vitamin B-12, take a B-12 supplement, or combine the two to meet the RDA of 2.4 µg daily. Up to 30% of people over 50 may have trouble absorbing protein-bound B-12 in foods.
- Because of the oxidative stress caused by smoking, smokers should get 35 mg more vitamin C per day than the RDA set for their age and sex. Supplements aren't usually necessary, however, because this extra vitamin C can easily be found in foods. For example, an 8-ounce glass of orange juice has about 100 mg of vitamin C.

Supplements may be recommended in other cases. Women with heavy menstrual flows, for example, may need extra iron. Older adults, people with dark skin, and people exposed to little sunlight may need extra vitamin D. Other people may benefit from supplementation based on their physical condition, the medicines they take, or their dietary habits.

Before deciding whether to take a vitamin or mineral supplement, consider whether you already eat a fortified breakfast cereal every day. Many breakfast cereals contain almost as many nutrients as a multivitamin pill. If you elect to take a supplement, choose one that contains 50–100% of the Daily Values for vitamins and minerals. Avoid supplements containing large doses of particular nutrients.

Reading Supplement Labels Dietary supplements include vitamins, minerals, amino acids, herbs, glandular extracts, enzymes, and other compounds. They are available as tablets, capsules, liquids, and powders. Although dietary supplements are often thought to be safe and “natural,” they can contain powerful bioactive chemicals that have the potential for harm. About one-quarter of all pharmaceutical drugs are derived from botanical sources—

morphine from poppies and digoxin from foxglove, for example. And as described earlier, even essential vitamins and minerals can have toxic effects if consumed in excess.

In the United States, dietary supplements are not legally considered drugs and are not regulated the same way drugs are. Before a drug is approved by the FDA and put on the market, it must undergo clinical studies to determine safety, effectiveness, side effects and risks, possible interactions with other substances, and appropriate dosages. The FDA does not authorize or test dietary supplements, and supplement manufacturers are not required to demonstrate either safety or effectiveness prior to marketing. Although dosage guidelines exist for some of the compounds in dietary supplements, dosages for many are not well established.

There are also key differences in how drugs and supplements are manufactured. FDA-approved medications are standardized for potency, and quality control and proof of purity are required. Dietary supplement manufacture is not as closely regulated, and there is no guarantee that a product even contains a given ingredient, let alone in the appropriate amount. The potency of herbal supplements tends to vary widely due to differences in growing and harvesting conditions, preparation methods, and storage. Some manufacturers attempt to standardize their products by isolating the compounds believed to be responsible for an herb's action. However, potency is often still highly variable, and when several compounds are thought to be responsible for an herb's effect, often only one is standardized. In addition, herbs can be contaminated or misidentified at any stage from harvest to packaging. (See Chapter 20 for more about herbal remedies.)

The FDA has recalled several products due to the presence of dangerous contaminants, including heavy metals and pharmaceutical drugs.

To provide consumers with more reliable and consistent information about supplements, the FDA requires supplements to have labels similar to those found on foods (see the

box “Using Dietary Supplement Labels” for more information). Label statements and claims about supplements are also regulated.

Finally, it is important to remember that dietary supplements are no substitute for a healthy diet. Supplements do not provide all the known—or yet-to-be-discovered—benefits of whole foods. Supplements should also not be used as a replacement for medical treatment for serious illnesses.

Protecting Yourself against Foodborne Illness

Many people worry about additives or pesticide residues in their food, but a greater threat comes from microorganisms that cause foodborne illnesses. Raw or undercooked animal products, such as chicken, hamburger, and oysters, pose the greatest

QUICK STATS

Salmonella infection was the most common foodborne infection reported in 2010 and was associated with the largest number of hospitalizations (2,290) and deaths (29).

—CDC, 2011

CRITICAL CONSUMER

Using Food Labels



The Nutrition Facts panel on a food label is designed to help consumers make food choices based on the nutrients that are most important to good health. In addition to listing nutrient content by weight, the label puts the information in the context of a daily diet of 2000 calories that includes no more than 65 grams of fat (approximately 30% of total calories). For example, if a serving of a particular product has 13 grams of fat, the label will show that the serving represents 20% of the daily fat allowance. If your daily diet contains fewer or more than 2000 calories, you need to adjust these calculations accordingly.

Food labels contain uniform serving sizes. This means that if you look at different brands of salad dressing, for example, you can compare calories and fat content based on the serving amount. It is important to keep in mind, however, that food label serving sizes may be larger or smaller than MyPlate serving size equivalents. Regulations also require that foods meet strict definitions if their packaging includes the terms *light*, *low-fat*, or *high-fiber*. Health claims such as “good source of dietary fiber” or “low in saturated fat” on packages are signals that those products can wisely be included in your diet. Overall, the food label is an important tool to help you choose a diet that conforms to MyPlate and the Dietary Guidelines.

Selected Nutrient Claims and What They Mean

Healthy A food that is low in fat, is low in saturated fat, has no more than 360–480 mg of sodium and 60 mg of cholesterol, and provides 10% or more of the Daily Value for vitamin A, vitamin C, protein, calcium, iron, or dietary fiber.

Light or lite 33% fewer calories or 50% less fat than a similar product.

Reduced or fewer At least 25% less of a nutrient than a similar product; can be applied to fat (“reduced fat”), saturated fat, cholesterol, sodium, and calories.

Extra or added 10% or more of the Daily Value per serving when compared to what a similar product has.

Good source 10–19% of the Daily Value for a particular nutrient per serving.

High, rich in, or excellent source of 20% or more of the Daily Value for a particular nutrient per serving.

Low calorie 40 or fewer calories per serving.

High fiber 5 g or more of fiber per serving.

Good source of fiber 2.5–4.9 g of fiber per serving.

Fat-free Less than 0.5 g of fat per serving.

Low-fat 3 g of fat or less per serving.

Saturated fat-free Less than 0.5 g of saturated fat and 0.5 g of trans fatty acids per serving.

Low saturated fat 1 g or less of saturated fat per serving and no more than 15% of total calories.

Cholesterol-free Less than 2 mg of cholesterol and 2 g or less of saturated fat per serving.

Low cholesterol 20 mg or less of cholesterol and 2 g or less of saturated fat per serving.

Low sodium 140 mg or less of sodium per serving.

Very low sodium 35 mg or less of sodium per serving.

Lean Cooked seafood, meat, or poultry with less than 10 g of fat, 4.5 g or less of saturated fat, and less than 95 mg of cholesterol per serving.

Extra lean Cooked seafood, meat, or poultry with less than 5 g of fat, 2 g of saturated fat, and 95 mg of cholesterol per serving.

NOTE: The FDA has not yet defined nutrient claims relating to carbohydrates, so foods labeled low- or reduced-carbohydrate do not conform to any approved standard.

SOURCE: FDA, Food. Appendix C: Health Claims (<http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/FoodLabelingGuide/ucm064919.htm>).

1. **Serving size:** Determine how many servings there are in the food package and compare it to how much you actually eat. You may need to adjust the rest of the nutrient values based on your typical serving size.

2. **Calories and calories from fat:** Note whether a serving is high in calories and fat. The sample food shown here is low in fat, with only 30 of its 235 calories from fat.

3. **Daily Values:** Based on a 2000-calorie diet, Daily Value percentages tell you whether the nutrients in a serving of food contribute a lot or a little to your total daily diet.
5% or less is low
20% or more is high

4. **Limit these nutrients:** Look for foods low in fat, saturated fat, trans fat, cholesterol, and sodium.

5. **Get enough of these nutrients:** Look for foods high in dietary fiber, vitamin A, vitamin C, calcium, and iron.



Nutrition Facts

Serving Size 1 cup (265g)
Servings per Container 2

Amount per Serving

Calories 235 **Calories from Fat** 30

% Daily Value*

Total Fat 3g 5%

Saturated Fat 1g 5%

Trans Fat 0.5g

Cholesterol 30mg 10%

Sodium 775mg 32%

Total Carbohydrate 34g 11%

Dietary Fiber 9g 36%

Sugars 5g

Protein 18g

Vitamin A 25% • **Vitamin C** 0%

Calcium 12% • **Iron** 20%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories	2,000	2,500
Total Fat	Less than	65g	80	
Sat Fat	Less than	20g	25g	
Cholesterol	Less than	300mg	300mg	
Sodium	Less than	2,400mg	2,400mg	
Total Carbohydrate		300g	375g	
Dietary Fiber		25g	30g	

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Footnote: This section shows recommended daily intake for two levels of calorie consumption and values for dietary calculations; it's the same on all labels.

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CRITICAL CONSUMER Using Dietary Supplement Labels

Since 1999 specific types of information have been required on the labels of dietary supplements. In addition to basic information about the product, labels include a "Supplement Facts" panel, modeled after the "Nutrition Facts" panel used on food labels (see the label illustrated below). Under the Dietary Supplement Health and Education Act (DSHEA) and food labeling laws, supplement labels can make three types of health-related claims:

- **Nutrient content claims**, such as "high in calcium," "excellent source of vitamin C," or "high potency." The claims "high in" and "excellent source of" mean the same as they do on food labels. A "high-potency" single-ingredient supplement must contain 100% of that nutrient's Daily Value; a "high-potency" multi-ingredient product must contain 100% or more of the Daily Value of at least two-thirds of the nutrients present for which Daily Values have been established.
- **Health claims**, if they have been authorized by the FDA or another authoritative scientific body. The association between adequate calcium intake and lower risk of osteoporosis is an example of an approved health claim. Since 2003 the FDA has also allowed so-called *qualified* health claims for situations in which there is emerging but as yet inconclusive evidence for a particular claim. Such claims must include qualifying language such as "scientific evidence suggests but does not prove" the claim.
- **Structure–function claims**, such as "antioxidants maintain cellular integrity" or "this product enhances energy levels." Because these claims are not reviewed by the FDA, they must carry a disclaimer (see the sample label).

Tips for Choosing and Using Dietary Supplements

- Check with your physician before taking a supplement. Many are not meant for children, older adults, women who are pregnant or breast-

feeding, people with chronic illnesses or upcoming surgery, or people taking prescription or OTC medications. When you visit your doctor, bring a list of all dietary supplements you are taking. Do not take megadoses (more than double the DRI levels) without your doctor's approval.

- Choose brands made by nationally known food and drug manufacturers or house brands from large retail chains. Due to their size and visibility, such sources are likely to have high manufacturing standards.
- Look for the USP verification mark on the label, indicating that the product meets minimum safety and purity standards developed under the Dietary Supplement Verification Program by the United States Pharmacopeia (USP). The USP mark means that the product (1) contains the listed ingredients, (2) has the declared amount and strength of ingredients, (3) will dissolve effectively, (4) has been screened for harmful contaminants, and (5) has been manufactured using safe, sanitary, and well-controlled procedures. The National Nutritional Foods Association (NNFA) has a self-regulatory testing program for its members; other associations and labs, including ConsumerLab.Com, also test and rate dietary supplements.
- Follow the label's cautions, directions for use, and dosage.
- If you experience side effects, stop using the product and contact your physician. Report any serious reactions to the FDA's MedWatch monitoring program (800-FDA-1088 or online at <http://www.fda.gov/Safety/MedWatch/default.htm>).

For More Information about Dietary Supplements

ConsumerLab.Com: <http://www.consumerlab.com>

Food and Drug Administration: <http://www.fda.gov/food/DietarySupplements/default.htm>

National Institutes of Health, Office of Dietary Supplements: <http://ods.od.nih.gov>

U.S. Department of Agriculture: <http://fnic.nal.usda.gov/dietary-supplements>

MOOD ENHANCER DIETARY SUPPLEMENT		Supplement Facts	
Statement of identity and net quantity	60 capsules	Serving Size 1 capsule	
Structure-function claim	<i>Specially formulated to enhance your mood, maintain healthy energy levels, and help you deal with daily stresses.*</i>	Amount per capsule	% Daily Value*
Directions for use and storage	DIRECTIONS FOR USE: Take one capsule twice daily with a meal Keep out of reach of children. Store in a cool, dry place, tightly closed. Color variation is normal in this product.	Vitamin B ₆ (as pyridoxine hydrochloride) 2.0 mg	100%
Warnings may appear on some labels	WARNING: FOR ADULTS ONLY. Do not exceed the recommended dosage. Do not use if you are pregnant, lactating, or taking prescription antidepressant or anti-anxiety medication. Do not use with alcohol. Do not use if you have allergies to the ragweed family. Limit exposure to the sun as St. John's wort may cause increased sensitivity to light. Discontinue use in the event of a rash.	Folic acid 200 mcg	50%
Disclaimer accompanying structure-function claim	PHENYLKETONURICS: CONTAINS PHENYLALANINE *This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.	Vitamin B ₁₂ (as cyanocobalamin) 6 mcg	100%
		St. John's wort aerial parts extract 300 mg (<i>Hypericum perforatum</i>)	†
		Kava root extract 250 mg (<i>Piper methysticum</i>)	†
		Siberian ginseng root extract 200 mg (<i>Eleutherococcus senticosus</i>)	†
		Phenylalanine (as L-phenylalanine hydrochloride) 100 mg	†
		*Percent Daily Values are based on a 2000 calorie diet. †Daily Value not established.	
		Other ingredients: Rice flour, gelatin, water	
		Standardization levels: St. John's wort: 0.3% hypericin; kava: 30% kavalactones; Siberian ginseng: 1% eleutherosides	
		Made by JKS Herbal Supplements, P.O. Box 2000, San Francisco, CA 94444.	

— Serving size

— Source and amount of ingredients with established Daily Values

— Name, source, and amount of ingredients without established Daily Values

— Standardization levels may appear on some labels

— Address to write to for more product information

threat, although in recent years contaminated fruits and vegetables have been catching up.

The CDC estimates that about 1000 reported disease outbreaks and approximately 48 million illnesses, 128,000 hospitalizations, and 3000 deaths occur each year in the United States due to foodborne illnesses. Symptoms include diarrhea, vomiting, fever, pain, headache, and weakness. Although the effects of foodborne illnesses are usually not serious, some groups, such as children, pregnant women, and the elderly, are more at risk for severe complications such as rheumatic diseases, seizures, blood poisoning, and death.

Causes of Foodborne Illnesses Most cases of foodborne illness are caused by **pathogens**—disease-causing microorganisms. Food can be contaminated with pathogens through improper handling, and pathogens can grow if food is prepared or stored improperly. According to the CDC, about 90% of foodborne illnesses, hospitalizations, and deaths in 2010 were due to seven pathogens: *Salmonella* (most often found in eggs, on vegetables, and on poultry); norovirus (most often found in salad ingredients and shellfish); *Campylobacter jejuni* (most often found in meat and poultry); *Toxoplasma* (most often found in meat); *Escherichia coli* (*E. coli*) O157:H7 (most often found in meat and water); *Listeria monocytogenes* (most often found in lunch meats, sausages, and hot dogs); and *Clostridium perfringens* (most often found in meat and gravy). *Salmonella* was the leading cause of hospitalizations and deaths, accounting for 28% of deaths and 35% of hospitalizations. About 60% of illness, but a much smaller percentage of severe illness, was caused by norovirus.

Other causes of foodborne illness include the bacteria *Clostridium perfringens*, *Vibrio vulnificus*, and *Yersinia enterocolytica*; the hepatitis A virus; the parasites *Trichinella spiralis* (found in pork and wild game), *Anisakis* (found in raw fish), *Giardia lamblia*, *Cyclospora cayetanensis*, and tapeworms; and certain molds.

Another potential threat from food is bovine spongiform encephalopathy (BSE), or “mad cow disease”—a fatal degenerative neurological disease caused by an abnormal protein that forms deposits in the brain. A variant form of the human version of this disease, known as Creutzfeldt-Jakob disease (CJD), is believed to be caused by eating beef contaminated with central nervous system tissue from BSE-infected cows. There have been at least 217 confirmed cases in 11 countries of this variant CJD among the hundreds of thousands of people who may have consumed BSE-contaminated products. In December 2003 the first BSE-infected cow in the United States was identified; no meat or organs from this animal had made it into the food supply. Although the USDA states that the risk to human health from BSE is extremely low, additional steps are being taken to prevent the BSE protein from entering the food supply.

Preventing and Treating Foodborne Illnesses Because every teaspoon of the soil that our food grows in contains about 2 billion bacteria (only some of them pathogenic),

we are always exposed to the possibility of a foodborne illness. You can't tell by taste, smell, or sight whether a food is contaminated. Raw foods are the most common source of foodborne illnesses; examples include raw meat and poultry that may have become contaminated during slaughter and produce such as spinach, lettuce, tomatoes, sprouts, and melons that become contaminated with salmonella, shigella, or *E. coli* during growing, harvesting, processing, storing, shipping, or final preparation. One in 10,000 eggs may be contaminated with *Salmonella* inside the egg shell.

Although foodborne illness outbreaks associated with food-processing plants make headlines, most cases of illness trace back to poor food handling in the home or in restaurants. The Dietary Guidelines for Americans encourage people to follow four basic food safety principles:

- **Clean** hands, food contact surfaces, and vegetables and fruits.
- **Separate** raw, cooked, and ready-to-eat foods while shopping, storing, and preparing foods.
- **Cook** foods to a safe temperature.
- **Chill** (refrigerate) perishable foods promptly.

If you think you may be having a bout of foodborne illness, drink plenty of fluids to prevent dehydration and consult a physician. For more details on handling food safely, see the box “Safe Food Handling.”

Although pathogens are usually destroyed during cooking, the U.S. government has taken steps to bring down levels



Careful food handling greatly reduces the risk of foodborne illness.

pathogen A microorganism that causes disease.

TERMS



TAKE CHARGE

Safe Food Handling

- Don't buy food in containers that leak, bulge, or are severely dented. Refrigerated foods should be cold and frozen foods should be solid when you buy them.
- Refrigerate perishable items as soon as possible after purchase. Use or freeze fresh meats within 3–5 days and fresh poultry, fish, and ground meat within 1–2 days.
- Store raw meat, poultry, fish, and shellfish in containers in the refrigerator so that the juices don't drip onto other foods. Keep these items away from other foods, surfaces, utensils, or serving dishes to prevent cross-contamination.
- Thaw frozen food in the refrigerator or in the microwave oven, not on the kitchen counter. Cook foods immediately after thawing.
- Thoroughly wash your hands with warm soapy water for 20 seconds before and after handling food, especially raw meat, fish, shellfish, poultry, or eggs.
- Make sure counters, cutting boards, dishes, utensils, and other equipment are thoroughly cleaned before and after use using hot soapy water. Wash dishcloths frequently.
- If possible, use separate cutting boards for meat, poultry, and seafood and for foods that will be eaten raw. Replace cutting boards once they become worn or develop hard-to-clean grooves.
- Thoroughly rinse and scrub fruits and vegetables with a brush, if possible, or peel off the skin.
- Cook foods thoroughly, especially beef, poultry, fish, pork, wild game, and eggs; cooking kills most microorganisms. Use a food thermometer to ensure that foods are cooked to a safe temperature. Hamburgers should be cooked to at least 160°F. Turn or stir microwaved food to make sure it is heated evenly throughout. When eating out, order hamburger cooked well-done and make sure foods are served piping hot.
- Keep hot foods hot (140°F or above) and cold foods cold (40°F or below). Harmful bacteria can grow rapidly between these two

temperatures. Refrigerate foods within two hours of purchase or preparation, and within one hour if the air temperature is above 90°F. Refrigerate foods at or below 40°F and freeze at or below 0°F. Use refrigerated leftovers within 3–4 days.

- Don't eat raw animal products, including raw eggs in home-made hollandaise sauce or eggnog. Use only pasteurized milk and juice, and look for pasteurized eggs, which are now available in some states.
- Cook eggs until they're firm, and fully cook foods containing eggs. Store eggs in the coldest part of the refrigerator, not in the door, and use them within 3–5 weeks.
- Avoid raw sprouts. Even sprouts grown under clean conditions in the home can be risky because bacteria may be present in the seeds. Cook sprouts before eating them.
- Read the food label and package information, and follow safety instructions such as "Keep Refrigerated" and the "Safe Handling Instructions."
- According to the USDA, "When in doubt, throw it out." Even if a food looks and smells fine, it may not be safe. If you aren't sure that a food has been prepared, served, and stored safely, don't eat it.

Additional precautions are recommended for people at particularly high risk for foodborne illness—pregnant women, young children, older people, and people with weakened immune systems or certain chronic illnesses. If you are a member of one of these groups, don't eat or drink any of the following products: unpasteurized juices; raw sprouts; unpasteurized (raw) milk and products made from unpasteurized milk; raw or undercooked meat, poultry, eggs, fish, and shellfish; and soft cheeses such as feta, Brie, Camembert, or blue-veined cheeses. To protect against *Listeria*, avoid ready-to-eat foods such as hot dogs, luncheon meats, and cold cuts unless they are reheated until they are steaming hot.

of contamination by improving national surveillance and testing. Raw meat and poultry products are now sold with safe handling and safe cooking instructions, and all packaged, unpasteurized fresh fruit and vegetable juices carry warnings about potential contamination. In 2011 the Food Safety Modernization Act (FSMA) was signed into law to reform the food safety system in the United States and further ensure the safety of the U.S. food supply. The FSMA allows the FDA to focus more on preventing food safety problems than on reacting to problems after they occur.

Environmental Contaminants

In addition to pathogens, environmental contaminants are also present in the food-growing environment. They include

various minerals, antibiotics, hormones, pesticides, industrial chemicals known as **PCBs (polychlorinated biphenyls)**, metals such as methyl mercury, and naturally occurring substances such as cyanogenic glycosides (found in lima beans and the pits of some fruits) and certain molds. Their effects depend on many factors, including concentration, length of exposure, and the age and health status of the person involved. Safety regulations attempt to keep our exposure to

polychlorinated biphenyl (PCB) An industrial chemical linked to certain cancers; banned worldwide in 1977 but persistent in the environment.

TERMS

contaminants at safe levels, but monitoring is difficult, and many substances (such as pesticides) persist in the environment long after being banned from use.

Organic Foods

Some people who are concerned about pesticides and other environmental contaminants choose to buy foods that are **organic**. To be certified as organic by the USDA, foods must meet strict production, processing, handling, and labeling criteria. Organic crops must meet limits on pesticide residues. For meat, milk, eggs, and other animal products to be certified organic, animals must be given organic feed and access to the outdoors and may not be given antibiotics or growth hormones. The use of genetic engineering, ionizing radiation, and sewage sludge is prohibited. Products can be labeled “100% organic” if they contain all organic ingredients and “organic” if they contain at least 95% organic ingredients; all such products may carry the USDA organic seal. A product with at least 70% organic ingredients can be labeled “made with organic ingredients” but cannot use the USDA seal.



Although organic foods may be contaminated with pesticides used on neighboring lands or on foods transported in the same train or truck, they tend to have lower levels of pesticide residues than conventionally grown crops. Some experts recommend that consumers who want to buy organic produce spend their money on those fruits and vegetables that have the highest levels of pesticide residue when grown conventionally (the “dirty dozen”): apples, bell peppers, celery, cherries, imported grapes, nectarines, peaches, pears, potatoes, red raspberries, spinach, and strawberries. Experts also recommend buying organic beef, poultry, eggs, dairy products, and baby food. Fruits and vegetables that carry little pesticide residue whether grown conventionally or organically include asparagus, avocados, bananas, broccoli, cauliflower, corn, kiwi, mangoes, onions, papaya, pineapples, and peas. All foods are subject to strict pesticide limits; the debate about the health effects of small amounts of residue is ongoing.

Whether organic foods are better for your health or not, organic farming is better for the environment. Benefits include sustainable farming practices, preservation of biodiversity, healthier soil, protection of water supplies, reduced use of fossil fuels, improved animal welfare, protection of ecosystems, and safer conditions for farmworkers. Buying organic food, buying locally grown foods, and participating in a community garden are ways to support food production that benefits and sustains the environment.

Guidelines for Fish Consumption

A specific area of concern has been mercury contamination in fish. Overall, fish and shellfish are healthy sources of protein, omega-3 fats, and other nutrients. Prudent choices can minimize the risk of any possible negative health effects. High mercury concentrations are most likely to be found in predator

fish—large fish that eat smaller fish. Mercury can cause brain damage in fetuses and young children.

According to FDA and Environmental Protection Agency (EPA) guidelines, as well as the Dietary Guidelines for Americans, women who are or who may become pregnant and nursing mothers should follow these guidelines to minimize their exposure to mercury:

- Do not eat shark, swordfish, king mackerel, or tilefish.
- Eat 8–12 ounces a week of a variety of fish and shellfish that is lower in mercury, such as shrimp, canned light tuna, salmon, pollock, and catfish. Limit consumption of albacore tuna to 6 ounces per week.
- Check advisories about the safety of recreationally caught fish from local lakes, rivers, and coastal areas; if no information is available, limit consumption to 6 ounces per week.

The same FDA/EPA guidelines apply to children, although they should consume smaller servings.

Additives in Food

Today approximately 3000 substances are intentionally added to foods to maintain or improve nutritional quality, to maintain freshness, to help in processing or preparation, or to alter taste or appearance. The most widely used food additives are sugar, salt, and corn syrup; these three plus citric acid, baking soda, vegetable colors, mustard, and pepper account for 98% by weight of all food additives used in the United States.

Some additives may be of concern for certain people, either because they are consumed in large quantities or because they cause some type of reaction. Additives having potential health concerns include nitrates and nitrites, used in processed meats and associated with the synthesis of cancer-causing agents in the stomach; BHA and BHT, used to maintain freshness and possibly associated with an increased risk of some cancers; sulfites, used to keep vegetables from turning brown and associated with severe reactions in sensitive people; and monosodium glutamate (MSG), used as a flavor enhancer and associated with episodes of increased blood pressure and sweating in sensitive people.

Food additives pose no significant health hazard to most people because the levels used are well below any that could produce toxic effects. To avoid potential problems, eat a variety of foods in moderation. If you are sensitive to an additive, check food labels when you shop, and ask questions when you eat out.

organic A designation applied to foods grown and produced according to strict guidelines limiting the use of pesticides, nonorganic ingredients, hormones, antibiotics, irradiation, genetic engineering, and other practices.

TERMS

Food Biotechnology

Food biotechnology techniques, such as crossbreeding, have been used by farmers for thousands of years to improve productivity and develop desirable qualities in animals and crops. Modern biotechnology tools, such as genetic engineering and cloning, allow for more precise, productive, and efficient development of crops and livestock. In 2005, 21 countries planted biotech crops covering a total of 222 million acres. In the United States, biotechnology is used in about 85% of the current soybean crop and 75% of cotton crops. The USDA, FDA, and EPA are the three federal agencies in charge of the regulatory oversight of biotechnology.

Irradiation Food irradiation is the treatment of foods with gamma rays, X-rays, or high-voltage electrons to kill potentially harmful pathogens, including bacteria, parasites, insects, and fungi that cause foodborne illness. Irradiation also reduces spoilage and extends a product's shelf life. For example, irradiated strawberries stay unspoiled in the refrigerator up to 3 weeks, versus only 3–5 days for untreated berries. The government permits the irradiation of certain foods, including wheat and flour, white potatoes, pork, herbs and spices, fruits and vegetables, raw poultry, red meat, and certain leafy green vegetables.

Even though irradiation has been generally endorsed by agencies such as the WHO, the CDC, and the American Medical Association (AMA), few irradiated foods are currently on the market due to consumer resistance and skepticism. Studies indicate that when consumers are given information about the process of irradiation and the benefits of irradiated foods, most want to purchase them. All primary irradiated foods (meat, vegetables, and so on) are labeled with the flowerlike radura symbol and a brief information label; spices and foods that are merely ingredients do not have to be so labeled.

When given information about irradiation and its benefits, most consumers want to purchase irradiated food products.



Genetically Modified Foods Genetic engineering involves altering the characteristics of a plant, animal, or microorganism by adding, rearranging, or replacing genes in its DNA; the result is a **genetically modified (GM) organism**. New DNA may come from related species or from entirely different types of organisms. Many GM crops are already grown in the United States. For example, some soybean crops in the United States have been genetically modified to be resistant to an herbicide used to kill weeds, and some GM corn crops carry genes for herbicide resistance or pest resistance. Products made with GM organisms include juice, soda, nuts, tuna, frozen pizza, spaghetti sauce, canola oil, chips, salad dressings, and soup.

The potential benefits of GM foods cited by supporters include improved yields overall and in difficult growing conditions, increased disease resistance, improved nutritional content, lower prices, and less pesticide use. Critics of biotechnology

argue that unexpected effects may occur. Gene manipulation could elevate levels of naturally occurring toxins or allergens, permanently change the gene pool, reduce biodiversity, and produce pesticide-resistant insects through the transfer of genes. Experience has shown that GM products are difficult to keep separate from non-GM products. Animal escapes, cross-pollination, and contamination during processing are just a few ways in which GM organisms could potentially appear unexpectedly in the food supply or the environment.

Animal Cloning In early 2008 the FDA concluded that meat and milk from cloned animals is no different from the meat and milk from naturally reproduced animals, and is thus safe for human consumption. Cloning allows producers to create animals with highly desirable characteristics, such as disease resistance and more predictable fat-to-lean meat ratios. Cloned animals are similar to identical twins. The FDA's regulations regarding cloned animals state that cloned cattle, pigs, and goats (as well as their offspring) are safe for human consumption.

Labeling of GM Foods Surveys indicate that most Americans want to know if their food contains GM ingredients or comes from cloned organisms. The FDA does not require special labeling for foods from genetically modified or cloned food sources. Under current rules, the FDA requires special labeling only when a food's composition is changed significantly or when a known allergen such as a peanut gene is introduced into a food. The only foods guaranteed not to contain GM ingredients are those certified as organic.

Food Allergies and Food Intolerances

For some people, consuming a particular food causes symptoms such as itchiness, swollen lips, or abdominal pain. Adverse reactions like these may be due to a food allergy or a food intolerance, and symptoms may range from annoying to life-threatening. If you've had an adverse reaction to a food, it's important to determine whether your symptoms are due to an allergy or an intolerance so that you can take appropriate action.

Food Allergies A true food allergy is a reaction of the body's immune system to a food or food ingredient, usually a

food irradiation The treatment of foods with gamma rays, X-rays, or high-voltage electrons to kill potentially harmful pathogens and increase shelf life.

TERMS

genetically modified (GM) organism A plant, animal, or microorganism in which genes have been added, rearranged, or replaced through genetic engineering.

food allergy An adverse reaction to a food or food ingredient in which the immune system perceives a particular substance (allergen) as foreign and acts to destroy it.

protein. The immune system perceives the reaction-provoking substance, or allergen, as foreign and acts to destroy it. This immune reaction can occur within minutes of ingesting the food, resulting in symptoms that affect the skin (hives), gastrointestinal tract (cramps or diarrhea), respiratory tract (asthma), or mouth (swelling of the lips or tongue). The most severe response is a systemic reaction called *anaphylaxis*, which involves a potentially life-threatening drop in blood pressure.

Food allergies affect only about 2% of the adult population and up to 5% of infants and young children. Although numerous food allergens have been identified, just eight foods account for more than 90% of the food allergies in the United States: cow's milk, eggs, peanuts, tree nuts (walnuts, cashews, and so on), soy, wheat, fish, and shellfish. Food labels are now required to state the presence of the eight most common allergens in plain language in the ingredient list. Individuals with food allergies, especially those prone to anaphylaxis, must diligently avoid trigger foods. This involves carefully reading food labels and asking questions about ingredients when eating out. People at risk are usually advised to carry medications to treat anaphylaxis, such as injectable epinephrine. Refer to Chapter 17 for more about allergies.

Food Intolerances Many people who believe they have food allergies may actually suffer from a much more common source of adverse food reactions—a **food intolerance**. In the case of a food intolerance, the problem usually lies with metabolism rather than with the immune system. Typically the body cannot adequately digest a food or food component, often because of some type of chemical deficiency; in other cases, the body reacts to a particular compound in a food. Lactose intolerance is a fairly common food intolerance. A more serious condition is intolerance of gluten, a protein component of some grains; in affected individuals, consumption of gluten damages the lining of the small intestine. Sulfite, a common food additive, can produce severe asthmatic reactions in sensitive individuals. Food intolerances have also been attributed to tartrazine (a yellow food coloring), MSG, and the sweetener aspartame.

Food intolerance reactions often produce symptoms similar to those of food allergies, such as diarrhea or cramps, but reactions are typically localized and not life-threatening.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What is the least healthy food you eat every day (either during meals or as a snack)? Identify at least one substitute that would be healthier but just as satisfying.

food intolerance An adverse reaction to a food or food ingredient that doesn't involve the immune system; intolerances are often due to a problem with metabolism.

TERMS

Many people with food intolerances can consume small amounts of the food that affects them; exceptions are gluten and sulfite, which must be avoided by sensitive individuals. Through trial and error, most people with food intolerances can adjust their intake of the trigger food to an appropriate level.

If you suspect that you have a food allergy or intolerance, a good first step is to keep a food diary. Note everything you eat or drink, any symptoms you develop, and how long after eating the symptoms appear. Then make an appointment with your physician to go over your diary and determine if any additional tests are needed.

connect™

Connect to Your Choices

Have you ever thought about why you eat the things you eat? Many factors can influence the food choices we make, some not as obvious as others. Do you buy packaged foods because they are convenient or seem less expensive? Do you eat at fast-food restaurants because they're on your way home? Do you have a "comfort food" that you eat when you're tired or upset?

What external factors influence your choices about food? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

Opportunities to improve your diet present themselves every day, and small changes add up.

RIGHT NOW YOU CAN:

- Substitute a healthy snack for an unhealthy one.
- Drink a glass of water and put a reusable water bottle in your backpack for tomorrow.
- Plan to make healthy selections when you eat out, such as steamed vegetables instead of french fries or salmon instead of steak.

IN THE FUTURE YOU CAN:

- Visit the MyPlate website at www.choosemyplate.gov and use the online tools to create a personalized nutrition plan and begin tracking your eating habits.
- Learn to cook healthier meals. There are hundreds of free websites and low-cost cookbooks that provide recipes for healthy dishes.

SUMMARY

- To function at its best, the human body requires about 45 essential nutrients in specific proportions. People get these nutrients from foods; the body cannot synthesize most of them.
- Proteins, made up of amino acids, form muscles and bones and help make up blood, enzymes, hormones, and cell membranes. Foods from animal sources provide complete proteins; plants provide incomplete proteins. Protein intake should be 10–35% of total daily calories.
- Fats, a concentrated source of energy, also help insulate the body and cushion the organs; 1 tablespoon of vegetable oil per day supplies the essential fats. Dietary fat intake should be 20–35% of total daily calories. Unsaturated fats should be favored over saturated and trans fats.
- Carbohydrates supply energy to the brain and other parts of the nervous system as well as to red blood cells. The body needs about 130 grams of carbohydrates a day, but more is recommended. Carbohydrates should make up 45–65% of total daily calories.
- Fiber includes nondigestible carbohydrates provided mainly by plants. Adequate intake of fiber (38 grams per day for men and 25 grams per day for women) can help people manage diabetes and high cholesterol levels and improve intestinal health.
- The 13 vitamins needed in the diet are organic substances that promote specific chemical and cell processes within living tissue. Deficiencies or excesses can cause serious illnesses and even death.
- The approximately 17 minerals needed in the diet are inorganic substances that regulate body functions, aid in the growth and maintenance of body tissues, and help in the release of energy from foods.
- Water is used to digest and absorb food, transport substances around the body, and regulate body temperature.
- Foods contain other substances such as phytochemicals, which may not be essential nutrients but may help reduce chronic disease risk.
- Dietary Reference Intakes (DRIs) are recommended intakes for essential nutrients that meet the needs of healthy people.
- The Dietary Guidelines for Americans are designed to help people make healthy and informed food choices. Following the guidelines promotes health and reduces the risk of chronic disease. The 2010 Dietary Guidelines for Americans present recommendations in several areas: balancing calories to manage weight, reducing certain food components, increasing other food components, building healthy eating patterns, and making healthy choices in the context of the current food and physical activity environment.
- Choosing the right amount of foods from each food group in MyPlate every day ensures that you get enough necessary nutrients without overconsuming calories.
- A vegetarian diet can meet human nutritional needs.
- Almost all foods have labels that show how much fat, cholesterol, protein, fiber, and sodium they contain. Serving sizes are standardized, and health claims are carefully regulated. Dietary supplements also have uniform labels.

- Foodborne illnesses are a greater threat to health than additives and environmental contaminants. Other dietary issues of concern to some people include organic foods, food irradiation, genetic modification of foods, and food allergies and intolerances.

FOR MORE INFORMATION

BOOKS

Byrd-Bredbenner, C., et al. 2012. *Wardlaw's Perspectives in Nutrition*, 9th ed. New York: McGraw-Hill. An easy-to-understand review of major concepts in nutrition.

Duyff, R. L. 2012. *ADA Complete Food and Nutrition Guide*, 4th ed. Hoboken, NJ: Wiley. An excellent review of current nutrition information.

Insel, P., D. Ross, K. McMahon, and M. Bernstein. 2011. *Nutrition*, 4th ed. Sudbury, MA: Jones & Bartlett. An introductory nutrition textbook covering a variety of key topics.

Nestle, M. 2007. *What to Eat*. New York: North Point Press. A nutritionist examines the marketing of food and explains how to interpret food-related information while shopping.

Selkowitz, A. 2005. *The College Student's Guide to Eating Well on Campus*, revised ed. Bethesda, MD: Tulip Hill Press. Provides practical advice for students, including how to make healthy choices when eating in a dorm or restaurant and how to stock a first pantry.

Warshaw, H. 2008. *Eat Out Eat Right: The Guide to Healthier Restaurant Eating*, 3rd ed. Agate Surrey. A registered dietitian provides realistic, informative guidelines for restaurant eating to enable diners to make healthy menu choices from a wide variety of foods and cuisines.

NEWSLETTERS

Environmental Nutrition (<http://www.environmentalnutrition.com>)

Nutrition Action Health Letter (<http://cspinet.org/nah>)

Tufts University Health & Nutrition Letter (<http://www.tuftshealthletter.com>)

ORGANIZATIONS, HOTLINES, AND WEBSITES

American Diabetes Association. An organization with the aim of leading the fight against the deadly consequences of diabetes and fighting for those affected by diabetes.

<http://www.diabetes.org>

Academy of Nutrition and Dietetics (formerly the American Dietetic Association). Provides a wide variety of nutrition-related educational materials.

<http://www.eatright.org>

The Dietary Guidelines. The official site for the Dietary Guidelines for Americans, 2010.

<http://www.dietaryguidelines.gov>

FDA Center for Food Safety and Applied Nutrition. Offers information about topics such as food labeling, food additives, dietary supplements, and foodborne illness.

<http://www.fda.gov/food>

Food Safety Hotlines. Provide information on safe purchase, handling, cooking, and storage of food.

888-SAFEFOOD (FDA)

800-535-4555 (USDA)

Fruit and Veggies: More Matters. A nonprofit organization designed to increase consumption of fruits and vegetables to five or more servings a day to improve the health of Americans.

<http://www.fruitsandveggiesmorematters.org>

Gateways to Government Nutrition Information. Provide access to government resources relating to food safety and nutrition.

<http://www.foodsafety.gov>

<http://www.nutrition.gov>

Harvard School of Public Health: The Nutrition Source. Provides recent key research findings, an overview of the Healthy Eating Plate, and suggestions for building a healthful diet.

<http://www.hsph.harvard.edu/nutritionsource>

Mayo Clinic: Nutrition Basics. Medical, nutrition, and health information and tools for healthy living.

<http://www.mayoclinic.com/health/nutrition-and-healthy-eating/MY00431>

MyPlate. Provides personalized dietary plans and interactive food and activity tracking tools.

<http://www.ChooseMyPlate.gov>

National Academies' Food and Nutrition Board. Provides information about the Dietary Reference Intakes and related guidelines.

<http://iom.edu/About-IOM/Leadership-Staff/Boards/Food-and-Nutrition-Board.aspx>

USDA Center for Nutrition Policy and Promotion. Includes information about the Dietary Guidelines and MyPlate.

<http://www.cnpp.usda.gov/>

USDA Food and Nutrition Information Center. Provides a variety of materials and extensive links relating to the Dietary Guidelines, food labels, MyPlate, and many other topics.

<http://www.nal.usda.gov/fnic>

See also the resources listed in Chapters 13–16 and 22.

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BEHAVIOR CHANGE STRATEGY

Improving Your Diet by Choosing Healthy Beverages

After reading this chapter and completing the dietary assessment, you can probably identify several ways to improve your diet. As an example here, we focus on choosing healthy beverages to increase intake of nutrients and decrease intake of empty calories from added sugars and fat. This model can be applied to any change you want to make to your diet.

Gather Data and Establish a Baseline

Begin by tracking your beverage consumption in a journal. Write down the types and amounts of beverages you drink, including water. Also note where you were at the time and whether you got the beverage there or brought it with you. At the same time, investigate your options. Find out what other beverages you can easily find during your daily routine. This information will help you put together a successful plan for change.

Analyze Your Data and Set Goals

Evaluate your beverage consumption by dividing your typical daily consumption between healthy and less healthy choices. Use the following guide as a basis, and add other beverages to the lists as needed:

Choose More Often	Servings Daily	Choose Less Often	Servings Daily
Water: plain, mineral, sparkling		Regular soda	
Low-fat or fat-free milk		Whole milk	
Fruit juice (100%)		Fruit beverages made with little fruit juice	
Unsweetened herbal tea		Sugar-sweetened beverages such as iced tea and sports drinks	
Others		Others	

How many beverages do you consume daily from each category? What would be a healthy and realistic goal for change? For example, if your beverage consumption is currently evenly divided between the “choose more often” and “choose less often” categories (four from each list), you might set a final goal for your behavior change program of increasing your healthy choices by two (to six from the “more often” list and two from the “less often” list).

Develop a Plan for Change

Once you’ve set your goal, you need to develop strategies that will help you choose healthy beverages more often. Consider the following possibilities:

- Keep healthy beverages on hand. If you live in a dorm, rent a small refrigerator or keep water in a reusable bottle and other healthy choices in the dorm kitchen’s refrigerator.
- Plan ahead, and carry a reusable bottle with water or 100% juice in your backpack every day.
- Check food labels on beverages for serving sizes, calories, and nutrients; comparison shop to find the healthiest choices, and watch your serving sizes. Use this information to make your “choose more often” list longer and more specific.
- If you eat out frequently, examine all the beverages available at the places you typically eat your meals. You’ll probably find that plain water or other healthy choices are available.

You may also need to make changes in your routine to decrease the likelihood that you’ll make unhealthy choices. For example, your journal might reveal that you always buy a soda after class when you pass a particular vending machine. If this is the case, try another route that bypasses the machine. Guard against impulse buying by carrying water or a healthy snack with you every day.

To complete your plan, try some of the other behavior change strategies described in Chapter 1: develop and sign a contract, set up a system of rewards, involve other people in your program, and develop strategies for challenging situations. Once your plan is complete, take action. Keep track of your progress by continuing to monitor and evaluate your beverage consumption.

Nutrition Resources

Table 1 Dietary Reference Intakes (DRIs): Recommended Levels for Individual Intake

LIFE STAGE	GROUP	BIOTIN (μG/DAY)	CHOLINE (MG/DAY) ^a	FOLATE (μG/DAY) ^b	NIACIN (MG/DAY) ^c	PANTOTHENIC ACID (MG/DAY)	RIBOFLAVIN (MG/DAY)		
Infants	0–6 months	5	125	65	2	1.7	0.3		
	7–12 months	6	150	80	4	1.8	0.4		
Children	1–3 years	8	200	150	6	2	0.5		
	4–8 years	12	250	200	8	3	0.6		
Males	9–13 years	20	375	300	12	4	0.9		
	14–18 years	25	550	400	16	5	1.3		
	19–30 years	30	550	400	16	5	1.3		
	31–50 years	30	550	400	16	5	1.3		
	51–70 years	30	550	400	16	5	1.3		
	>70 years	30	550	400	16	5	1.3		
	Females	9–13 years	20	375	300	12	4	0.9	
Females	14–18 years	25	400	400 ⁱ	14	5	1.0		
	19–30 years	30	425	400 ⁱ	14	5	1.1		
	31–50 years	30	425	400 ⁱ	14	5	1.1		
	51–70 years	30	425	400 ⁱ	14	5	1.1		
	>70 years	30	425	400	14	5	1.1		
	Pregnancy	≤18 years	30	450	600 ^j	18	6	1.4	
	19–30 years	30	450	600 ^j	18	6	1.4		
Lactation	31–50 years	30	450	600 ^j	18	6	1.4		
	≤18 years	35	550	500	17	7	1.6		
	19–30 years	35	550	500	17	7	1.6		
	31–50 years	35	550	500	17	7	1.6		
Tolerable Upper Intake Levels for Adults (19–70)			3500	1000 ^k	35 ^k				
LIFE STAGE	GROUP	THIAMIN (MG/DAY)	VITAMIN A (μG/DAY) ^d	VITAMIN B-6 (MG/DAY)	VITAMIN B-12 (μG/DAY)	VITAMIN C (MG/DAY) ^e	VITAMIN D (IU/DAY) ^f	VITAMIN E (MG/DAY) ^g	
Infants	0–6 months	0.2	400	0.1	0.4	40	400*	4	
	7–12 months	0.3	500	0.3	0.5	50	400*	5	
Children	1–3 years	0.5	300	0.5	0.9	15	600	6	
	4–8 years	0.6	400	0.6	1.2	25	600	7	
Males	9–13 years	0.9	600	1.0	1.8	45	600	11	
	14–18 years	1.2	900	1.3	2.4	75	600	15	
	19–30 years	1.2	900	1.3	2.4	90	600	15	
	31–50 years	1.2	900	1.3	2.4	90	600	15	
	51–70 years	1.2	900	1.7	2.4 ^h	90	600	15	
	>70 years	1.2	900	1.7	2.4 ^h	90	800	15	
	Females	9–13 years	0.9	600	1.0	1.8	45	600	11
Females	14–18 years	1.0	700	1.2	2.4	65	600	15	
	19–30 years	1.1	700	1.3	2.4	75	600	15	
	31–50 years	1.1	700	1.3	2.4	75	600	15	
	51–70 years	1.1	700	1.5	2.4 ^h	75	600	15	
	>70 years	1.1	700	1.5	2.4 ^h	75	800	15	
	Pregnancy	≤18 years	1.4	750	1.9	2.6	80	600	15
	19–30 years	1.4	770	1.9	2.6	85	600	15	
Lactation	31–50 years	1.4	770	1.9	2.6	85	600	15	
	≤18 years	1.4	1200	2.0	2.8	115	600	19	
	19–30 years	1.4	1300	2.0	2.8	120	600	19	
	31–50 years	1.4	1300	2.0	2.8	120	600	19	
Tolerable Upper Intake Levels for Adults (19–70)			3000	100		2000	4000	1000 ^k	
NOTE: The table includes values for the type of DRI standard—Adequate Intake (AI) or Recommended Dietary Allowance (RDA)—that has been established for that particular nutrient and life stage; RDAs are shown in bold type . The final row of the table shows the Tolerable Upper Intake Levels (ULs) for adults; refer to the full DRI report for information on other ages and life stages. A UL is the maximum level of daily nutrient intake that is likely to pose no risk of adverse effects. There are insufficient data to set ULs for all nutrients, but this does not mean that there is no potential for adverse effects; source of intake should be from food only to prevent high levels of intake of nutrients without established ULs. In healthy individuals, there is no established benefit from nutrient intakes above the RDA or AI.									
^a Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.									
^b As dietary folate equivalents (DFE): 1 DFE = 1 μg food folate = 0.6 μg folate from fortified food or as a supplement consumed with food = 0.5 μg of a supplement taken on an empty stomach.									
^c As niacin equivalents (NE): 1 mg niacin = 60 mg tryptophan.									
^d As retinol activity equivalents (RAEs): 1 RAE = 1 μg retinol, 12 μg β-carotene, or 24 μg α-carotene or β-cryptoxanthin. Preformed vitamin A (retinol) is abundant in animal-derived foods; provitamin A carotenoids are abundant in some dark yellow, orange, red, and deep-green fruits and vegetables. For preformed vitamin A and for provitamin A carotenoids in supplements, 1 RE = 1 RAE; for provitamin A carotenoids in foods, divide the REs by 2 to obtain RAEs. The UL applies only to preformed vitamin A.									

Table 1

Dietary Reference Intakes (DRIs): Recommended Levels for Individual Intake
(continued)

LIFE STAGE	GROUP	VITAMIN K (μG/DAY)	CALCIUM (MG/DAY)	CHROMIUM (μG/DAY)	COPPER (μG/DAY)	FLUORIDE (MG/DAY)	IODINE (μG/DAY)	
Infants	0–6 months	2.0	200*	0.2	200	0.01	110	
	7–12 months	2.5	260*	5.5	220	0.5	130	
Children	1–3 years	30	700	11	340	0.7	90	
	4–8 years	55	1000	15	440	1	90	
Males	9–13 years	60	1300	25	700	2	120	
	14–18 years	75	1300	35	890	3	150	
	19–30 years	120	1000	35	900	4	150	
	31–50 years	120	1000	35	900	4	150	
	51–70 years	120	1000	30	900	4	150	
	>70 years	120	1200	30	900	4	150	
Females	9–13 years	60	1300	21	700	2	120	
	14–18 years	75	1300	24	890	3	150	
	19–30 years	90	1000	25	900	3	150	
	31–50 years	90	1000	25	900	3	150	
	51–70 years	90	1200	20	900	3	150	
	>70 years	90	1200	20	900	3	150	
Pregnancy	≤8 years	75	1300	29	1000	3	220	
	19–30 years	90	1000	30	1000	3	220	
	31–50 years	90	1000	30	1000	3	220	
Lactation	≤18 years	75	1300	44	1300	3	290	
	19–30 years	90	1000	45	1300	3	290	
	31–50 years	90	1000	45	1300	3	290	
Tolerable Upper Intake Levels for Adults (19–70)			2500		10,000	10	1100	
LIFE STAGE	GROUP	IRON (MG/DAY) ¹	MAGNESIUM (MG/DAY)	MANGANESE (MG/DAY)	MOLYBDENUM (μG/DAY)	PHOSPHORUS (MG/DAY)	SELENIUM (MG/DAY)	ZINC (MG/DAY) ^M
Infants	0–6 months	0.27	30	0.003	2	100	15	2
	7–12 months	11	75	0.6	3	275	20	3
Children	1–3 years	7	80	1.2	17	460	20	3
	4–8 years	10	130	1.5	22	500	30	5
Males	9–13 years	8	240	1.9	34	1250	40	8
	14–18 years	11	410	2.2	43	1250	55	11
	19–30 years	8	400	2.3	45	700	55	11
	31–50 years	8	420	2.3	45	700	55	11
	51–70 years	8	420	2.3	45	700	55	11
	>70 years	8	420	2.3	45	700	55	11
Females	9–13 years	8	240	1.6	34	1250	40	8
	14–18 years	15	360	1.6	43	1250	55	9
	19–30 years	18	310	1.8	45	700	55	8
	31–50 years	18	320	1.8	45	700	55	8
	51–70 years	8	320	1.8	45	700	55	8
	>70 years	8	320	1.8	45	700	55	8
Pregnancy	≤8 years	27	400	2.0	50	1250	60	13
	19–30 years	27	350	2.0	50	700	60	11
	31–50 years	27	360	2.0	50	700	60	11
Lactation	≤18 years	10	360	2.6	50	1250	70	14
	19–30 years	9	310	2.6	50	700	70	12
	31–50 years	9	320	2.6	50	700	70	12
Tolerable Upper Intake Levels for Adults (19–70)		45	350 ^k	11	2000	4000	400	40

*Individuals who smoke require an additional 35 mg/day of vitamin C over that needed by nonsmokers; nonsmokers regularly exposed to tobacco smoke should ensure they meet the RDA for vitamin C.

¹As cholecalciferol: 1 μg cholecalciferol = 40 IU vitamin D. DRI values are based on the absence of adequate exposure to sunlight.

²As α-tocopherol. Includes naturally occurring RRR-α-tocopherol and the 2R-stereoisomeric forms from supplements; does not include the 2S-stereoisomeric forms from supplements.

³Because 10–30% of older people may malabsorb foodbound B-12, those over age 50 should meet their RDA mainly with supplements or foods fortified with B-12.

⁴In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 μg from supplements or fortified foods in addition to consuming folate from a varied diet.

⁵It is assumed that women will continue consuming 400 μg from supplements or fortified food until their pregnancy is confirmed and they enter prenatal care, which ordinarily occurs after the end of the periconceptional period—the critical time for formation of the neural tube.

⁶The UL applies only to intake from supplements, fortified foods, and/or pharmacological agents and not to intake from foods.

⁷Because the absorption of iron from plant foods is low compared to that from animal foods, the RDA for strict vegetarians is approximately 1.8 times higher than the values established for omnivores (14 mg/day for adult male vegetarians; 33 mg/day for premenopausal female vegetarians). Oral contraceptives (OCs) reduce menstrual blood losses, so women taking them need less daily iron; the RDA for premenopausal women taking OCs is 10.9 mg/day. For more on iron requirements for other special situations, refer to *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (visit <http://www.nap.edu> for the complete report).

⁸Zinc absorption is lower for those consuming vegetarian diets, so the zinc requirement for vegetarians is approximately twofold greater than for those consuming a nonvegetarian diet.

Table 1

Dietary Reference Intakes (DRIs): Recommended Levels for Individual Intake
(continued)

LIFE STAGE	GROUP	POTASSIUM (G/DAY)	SODIUM (G/DAY)	CHLORIDE (G/DAY)	CARBOHYDRATE		TOTAL FIBER RDA/AI (G/DAY)	TOTAL FAT AMDR ^a (%)
					RDA/AI (G/DAY)	AMDR ^a (%)		
Infants	0–6 months	0.4	0.12	0.18	60	ND ^a	ND	^r
	7–12 months	0.7	0.37	0.57	95	ND ^a	ND	^r
Children	1–3 years	3.0	1.0	1.5	130	45–65	19	30–40
	4–8 years	3.8	1.2	1.9	130	45–65	25	25–35
Males	9–13 years	4.5	1.5	2.3	130	45–65	31	25–35
	14–18 years	4.7	1.5	2.3	130	45–65	38	25–35
	19–30 years	4.7	1.5	2.3	130	45–65	38	20–35
	31–50 years	4.7	1.5	2.3	130	45–65	38	20–35
	51–70 years	4.7	1.3	2.0	130	45–65	30	20–35
	>70 years	4.7	1.2	1.8	130	45–65	30	20–35
Females	9–13 years	4.5	1.5	2.3	130	45–65	26	25–35
	14–18 years	4.7	1.5	2.3	130	45–65	26	25–35
	19–30 years	4.7	1.5	2.3	130	45–65	25	20–35
	31–50 years	4.7	1.5	2.3	130	45–65	25	20–35
	51–70 years	4.7	1.3	2.0	130	45–65	21	20–35
	>70 years	4.7	1.2	1.8	130	45–65	21	20–35
Pregnancy	≤18 years	4.7	1.5	2.3	175	45–65	28	20–35
	19–30 years	4.7	1.5	2.3	175	45–65	28	20–35
	31–50 years	4.7	1.5	2.3	175	45–65	28	20–35
Lactation	≤18 years	5.1	1.5	2.3	210	45–65	29	20–35
	19–30 years	5.1	1.5	2.3	210	45–65	29	20–35
	31–50 years	5.1	1.5	2.3	210	45–65	29	20–35

Tolerable Upper Intake
Levels for Adults (19–70)

LIFE STAGE	GROUP	LINOLEIC ACID		ALPHA-LINOLENIC ACID		PROTEIN ^b		WATER ^c (L/DAY)
		RDA/AI (G/DAY)	AMDR ^a (%)	RDA/AI (G/DAY)	AMDR ^a (%)	RDA/AI (G/DAY)	AMDR ^a (%)	
Infants	0–6 months	4.4	ND ^a	0.5	ND ^a	9.1	ND ^a	0.7
	7–12 months	4.6	ND ^a	0.5	ND ^a	13.5	ND ^a	0.8
Children	1–3 years	7	5–10	0.7	0.6–1.2	13	5–20	1.3
	4–8 years	10	5–10	0.9	0.6–1.2	19	10–30	1.7
Males	9–13 years	12	5–10	1.2	0.6–1.2	34	10–30	2.4
	14–18 years	16	5–10	1.6	0.6–1.2	52	10–30	3.3
	19–30 years	17	5–10	1.6	0.6–1.2	56	10–35	3.7
	31–50 years	17	5–10	1.6	0.6–1.2	56	10–35	3.7
	51–70 years	14	5–10	1.6	0.6–1.2	56	10–35	3.7
	>70 years	14	5–10	1.6	0.6–1.2	56	10–35	3.7
Females	9–13 years	10	5–10	1.0	0.6–1.2	34	10–30	2.1
	14–18 years	11	5–10	1.1	0.6–1.2	46	10–30	2.3
	19–30 years	12	5–10	1.1	0.6–1.2	46	10–35	2.7
	31–50 years	12	5–10	1.1	0.6–1.2	46	10–35	2.7
	51–70 years	11	5–10	1.1	0.6–1.2	46	10–35	2.7
	>70 years	11	5–10	1.1	0.6–1.2	46	10–35	2.7
Pregnancy	≤18 years	13	5–10	1.4	0.6–1.2	71	10–35	3.0
	19–30 years	13	5–10	1.4	0.6–1.2	71	10–35	3.0
	31–50 years	13	5–10	1.4	0.6–1.2	71	10–35	3.0
Lactation	≤18 years	13	5–10	1.3	0.6–1.2	71	10–35	3.8
	19–30 years	13	5–10	1.3	0.6–1.2	71	10–35	3.8
	31–50 years	13	5–10	1.3	0.6–1.2	71	10–35	3.8

^aDaily protein recommendations are based on body weight for reference body weights. To calculate for a specific body weight, use the following values: 1.5 g/kg for infants, 1.1 g/kg for 1–3 years, 0.95 g/kg for 4–13 years, 0.85 g/kg for 14–18 years, 0.8 g/kg for adults, and 1.1 g/kg for pregnant (using prepregnancy weight) and lactating women.

^aAcceptable Macronutrient Distribution Range (AMDR), expressed as a percentage of total daily calories, is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individual consumes in excess of the AMDR, there is a potential for increasing the risk of chronic diseases and/or insufficient intakes of essential nutrients.

^bTotal water intake from fluids and food.

^cNot determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

^rFor infants, adequate intake of total fat is 31 grams/day (0–6 months) and 30 grams per day (7–12 months) from breast milk and, for infants 7–12 months, complementary food and beverages.

SOURCE: From Food and Nutrition Board, Institute of Medicine, National Academies, 2010, *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, DC: National Academies Press. <http://www.iom.edu/Activities/Nutrition/SummaryDRIs/DRI-Tables.aspx>. Reprinted with permission from the National Academies Press, Copyright 2010, National Academy of Sciences.

Nutrition Resources

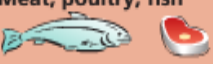
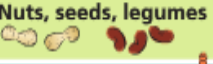
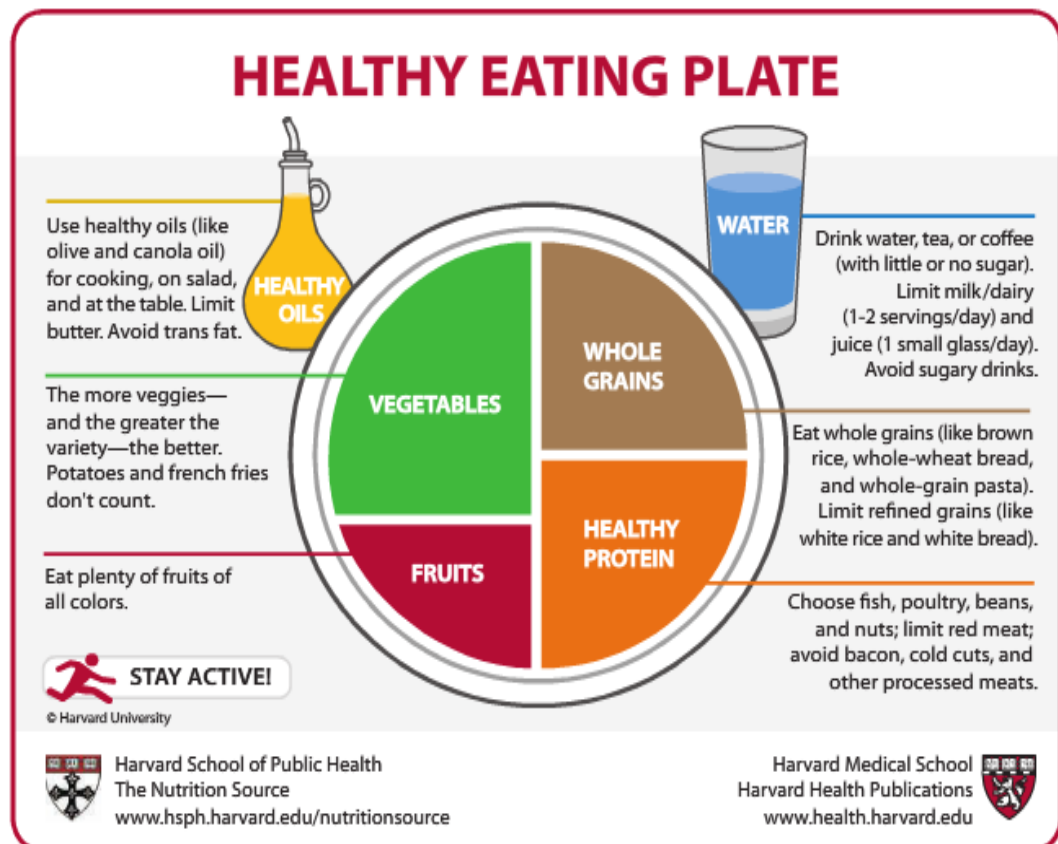
Food groups	Number of servings per day (or per week, as noted)				Serving sizes and notes
	1600 calories	2000 calories	2600 calories	3100 calories	
Grains 	6	6–8	10–11	12–13	1 slice bread, 1 oz dry cereal, 1/2 cup cooked rice, pasta, or cereal; choose whole grains
Vegetables 	3–4	4–5	5–6	6	1 cup raw leafy vegetables, 1/2 cup cooked vegetables, 1/2 cup vegetable juice
Fruits 	4	4–5	5–6	6	1/2 cup fruit juice, 1 medium fruit, 1/4 cup dried fruit, 1/2 cup fresh, frozen, or canned fruit
Low-fat or fat-free dairy foods 	2–3	2–3	3	3–4	1 cup milk; 1 cup yogurt, 1-1/2 oz cheese; choose fat-free or low-fat types
Meat, poultry, fish 	3–6	6 or less	6	6–9	1 oz cooked meats, poultry, or fish: select only lean; trim away visible fats; broil, roast, or boil instead of frying; remove skin from poultry
Nuts, seeds, legumes 	3 servings/week	4–5 servings/week	1	1	1/3 cup or 1-1/2 oz nuts, 2 Tbsp or 1/2 oz seeds, 1/2 cup cooked dry beans/peas, 2 Tbsp peanut butter
Fats and oils 	2	2–3	3	4	1 tsp soft margarine; 1 Tbsp low-fat mayonnaise, 2 Tbsp light salad dressing, 1 tsp vegetable oil; DASH has 27% of calories as fat (low in saturated fat)
Sweets 	0	5 servings/week or less	2	2	1 Tbsp sugar, 1 Tbsp jelly or jam, 1/2 cup sorbet, 1 cup lemonade; sweets should be low in fat

FIGURE 1 The DASH Eating Plan.

SOURCE: National Institutes of Health, National Heart, Lung, and Blood Institute. 2006. *Your Guide to Lowering Your Blood Pressure with DASH*. (http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf; retrieved May 8, 2012).

FIGURE 2 Healthy Eating Plate. The Healthy Eating Plate is an alternative food group plan developed by researchers at the Harvard School of Public Health. The Healthy Eating Plate distinguishes among the various dietary sources of fat, protein, carbohydrate, and fluids, and it includes a reminder to be physically active. Copyright © 2011 Harvard University. For more information about The Healthy Eating Plate, please see *The Nutrition Source*, Department of Nutrition, Harvard School of Public Health, <http://www.thenutritionsource.org> and Harvard Health Publications, health.harvard.edu.





Exercise for Health and Fitness

LOOKING AHEAD...

After reading this chapter, you should be able to

- Define physical fitness, and list the health-related components of fitness
- Explain the wellness benefits of physical activity and exercise
- Describe how to develop each of the health-related components of fitness
- Describe how to choose appropriate exercise equipment, how to eat and drink for exercise, and how to prevent and manage injuries
- Explain and apply different methods for assessing fitness levels
- Put together a personalized exercise program that you enjoy and that will enable you to achieve your fitness goals

TEST YOUR KNOWLEDGE

1. To improve your health, you must exercise vigorously for at least 30 minutes straight, five or more days per week.
True or false?
2. Which of the following is (are) considered a form of cardiorespiratory endurance exercise?
 - a. Walking
 - b. Swimming
 - c. Step aerobics
3. Developing strength in the trunk muscles is the most important way to prevent low-back pain.
True or false?
4. The terms physical activity and exercise mean the same thing.
True or false?

ANSWERS

1. **FALSE.** For substantial health benefits, adults should do at least 150 minutes (2½ hours) a week of moderate-intensity aerobic physical activity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. The activity can be done in short bouts—10-minute sessions, for example—spread out over the week.
2. **ALL THREE.** You can develop cardiorespiratory endurance through activities that involve continuous, rhythmic movements of large muscle groups, such as the legs. Many kinds of activities count as cardiorespiratory endurance exercise.
3. **FALSE.** Although muscular strength is an important factor in low-back health, muscular endurance in the trunk and hips is actually more important for preventing low-back pain.
4. **FALSE.** Physical activity is any body movement carried out by the skeletal muscles that requires energy. Exercise is planned, structured, repetitive movement performed specifically to improve or maintain physical fitness.

Your body is a wonderful moving machine made to work best when it is physically active. It readily adapts to practically any level of activity and exercise: the more you ask of your body, the stronger and more fit it becomes. The opposite is also true. Left unchallenged, bones lose their density, joints stiffen, muscles become weak, and the body's energy

systems degenerate. To be truly healthy, human beings must be active.

This chapter gives you the basic information you need to put together a physical fitness program that will work for you. If approached correctly, physical activity and exercise can contribute immeasurably to overall wellness, add fun and joy to life, and provide the foundation for a lifetime of fitness.

WHAT IS PHYSICAL FITNESS?

Physical fitness is a set of physical attributes that allow the body to respond or adapt to the demands and stress of physical effort—to perform moderate to vigorous levels of physical activity without becoming overly tired. A person's level of fitness depends on physiological factors, such as the heart's ability to pump blood and the energy-generating capacity of the cells. These factors depend on genetics—a person's inborn potential for physical fitness—and on behavior—getting enough physical activity to stress the body and cause long-term physiological changes.

Some components of fitness are related to specific activities or sports, while others relate to general health. **Health-related fitness** includes the following components:

- Cardiorespiratory endurance.
- Muscular strength.
- Muscular endurance.
- Flexibility.
- Body composition.

Health-related fitness helps you withstand physical challenges and protects you from diseases.

Cardiorespiratory Endurance

Cardiorespiratory endurance is the ability to perform prolonged, large-muscle, dynamic exercise at moderate to high intensity. It depends on such factors as the lungs' ability to deliver oxygen to the bloodstream, the heart's capacity to pump blood, the ability of the nervous system and blood vessels to regulate blood flow, and the cells' ability to use oxygen and process fuels for exercise.

When cardiorespiratory fitness is low, the heart has to work hard during normal daily activities and may not be able to work hard enough to sustain high-intensity physical activity in an emergency. Poor cardiorespiratory fitness is linked with heart disease, diabetes, colon cancer, stroke, depression, anxiety, and premature death from all causes.

Regular **cardiorespiratory endurance training**, however, conditions the heart. Endurance training makes the heart stronger and improves the function of the entire cardiorespiratory system. As cardiorespiratory fitness improves, related physical functions also improve:

- The heart pumps more blood per heartbeat.
- Resting heart rate slows and resting blood pressure decreases.
- Blood volume increases.
- Blood supply to tissues improves.
- The body can cool itself better.

- Metabolic health improves, which helps the body process fuels and regulate cell function.

A healthy heart can better withstand the strains of daily life, the stress of occasional emergencies, and the wear and tear of time.

Endurance training also improves the function of the body's chemical systems, particularly in the muscles and liver, enhancing the body's ability to use energy from food and to do more exercise with less effort.

You can develop cardiorespiratory endurance through activities that involve continuous, rhythmic movements of large muscle groups, such as the legs. Such activities include walking, jogging, cycling, and aerobic dancing.

Muscular Strength

Muscular strength is the amount of force a muscle can produce with a single maximum effort. It depends on such factors as the size of muscle cells and the ability of nerves to activate muscle cells. Strong muscles are important for everyday activities, such as climbing stairs, as well as for emergencies. They help keep the skeleton in proper alignment, preventing back and leg pain and providing the support necessary for good posture. Muscular strength has obvious importance in recreational activities. Strong people can hit a tennis ball harder, kick a soccer ball farther, and ride a bicycle uphill more easily.

Muscle tissue is an important element of overall body composition. Greater muscle mass makes possible a higher rate of metabolism and faster energy use, which help maintain a healthy body weight.

Maintaining strength and muscle mass is vital for healthy aging. Older people tend to lose muscle cells (a condition called *sarcopenia*), and many of the remaining muscle cells become nonfunctional because they lose their attachment to the nervous system. Strength training helps maintain muscle mass, function, and balance in older people,

QUICK STATS

Only **3.8%** of elementary schools, **7.9%** of middle schools, and **2.1%** of high schools in the United States require daily physical education.

—CDC, 2009

physical fitness The body's ability to respond or adapt to the demands and stress of physical effort.

health-related fitness Physical capabilities that contribute to health, including cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition.

cardiorespiratory endurance The ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate to high levels of intensity.

cardiorespiratory endurance training Exercise intended to improve cardiorespiratory endurance.

muscular strength The amount of force a muscle can produce with a single maximum effort.

TERMS



Cardiorespiratory endurance is a critical component of fitness.

which greatly enhances their quality of life and prevents injuries. Strength training promotes cardiovascular health, reduces the risk of osteoporosis (bone loss), and prevents premature death from all causes.

Muscular strength can be developed by training with weights or by using the weight of the body for resistance during calisthenic exercises such as push-ups and curl-ups.

Muscular Endurance

Muscular endurance is the ability to resist fatigue and sustain a given level of muscle tension—that is, to hold a muscle contraction for a long time or to contract a muscle over and over again. It depends on factors such as the size of muscle cells, the ability of muscles to store fuel, the content of mitochondria (cell energy centers), and the blood supply to muscles.

Muscular endurance is important for good posture and for injury prevention. For example, if abdominal and back muscles cannot hold the spine correctly, the chances of low-back pain and back injury are increased. In fact, good muscular endurance in the trunk muscles is more important than muscular strength for preventing back pain. Muscular endurance helps people cope with the physical demands of everyday life and enhances performance in sports and work.

Stressing the muscles with a greater load (weight) than they are used to develops muscle endurance as well as muscu-

lar strength. The degree to which strength or endurance develops depends on the type and amount of stress that is applied.

Flexibility

Flexibility is the ability of joints to move through their full range of motion. It depends on joint structure, the length and elasticity of connective tissue, and nervous system activity. Flexible, pain-free joints are important for good health and well-being. Inactivity causes the joints to become stiffer with age. Stiffness, in turn, often causes older people to assume unnatural body postures that can stress joints and muscles.

Stretching exercises can help ensure a healthy range of motion for all major joints.

Body Composition

Body composition refers to the proportion of fat and **fat-free mass** (muscle, bone, and water) in the body. Healthy body composition involves a high proportion of fat-free mass and an acceptably low level of body fat, adjusted for age and sex. A person with excessive body fat—especially in the abdomen—is more likely to experience health problems, including heart disease, high blood pressure, stroke, joint problems, diabetes, gallbladder disease, cancer, and back pain.

The best way to lose fat is through a lifestyle that includes a sensible diet and exercise. The best way to add muscle mass is through resistance training such as weight training. (Chapter 14 discusses body composition in detail.)

Skill-Related Components of Fitness

In addition to the five health-related components of physical fitness, the ability to perform a particular sport or activity may depend on **skill-related fitness** components such as the following:

- **Speed**—the ability to perform a movement in a short period of time.
- **Power**—the ability to exert force rapidly, based on a combination of strength and speed.

TERMS

muscular endurance The ability of a muscle or group of muscles to remain contracted or to contract repeatedly for a long period of time.

flexibility The joints' ability to move through their full range of motion.

body composition The proportion of fat and fat-free mass (muscle, bone, and water) in the body.

fat-free mass The nonfat components of the human body, consisting of skeletal muscle, bone, and water.

skill-related fitness Physical abilities that contribute to performance in a sport or activity, including speed, power, agility, balance, coordination, and reaction time.

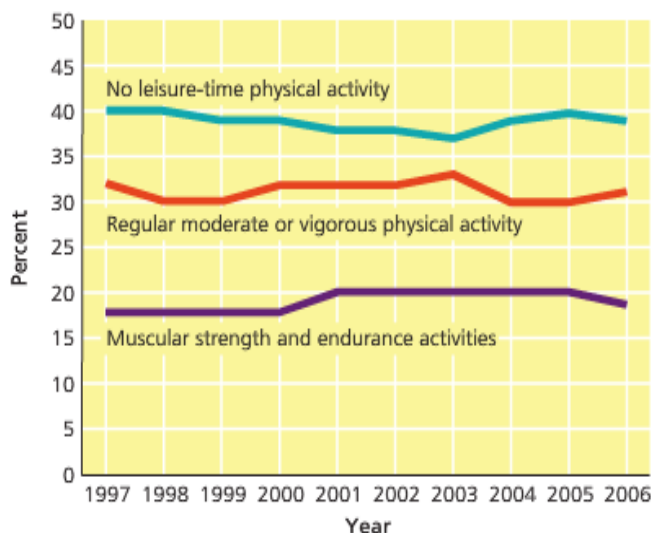
- **Agility**—the ability to change the body's position quickly and accurately.
- **Balance**—the ability to maintain equilibrium while either moving or stationary.
- **Coordination**—the ability to perform motor tasks accurately and smoothly using body movements and the senses.
- **Reaction time**—the ability to respond quickly to a stimulus.

Skill-related fitness tends to be sport-specific and is best developed through practice. For example, the speed, coordination, and agility needed to play basketball are best developed by playing basketball. Playing a sport can be fun, can help build fitness, and may contribute to other areas of wellness.

PHYSICAL ACTIVITY AND EXERCISE FOR HEALTH AND FITNESS

Despite the many benefits of an active lifestyle, levels of physical activity remain low for all populations of Americans (see Figure 13.1). In December 2008 the CDC reported the following statistics about the physical activity levels of adult Americans:

- About 31% participate in some leisure-time physical activity.
- Leisure-time physical activity decreased by nearly 6% between 2003 and 2009. Physical activity levels decline with age; are higher in men than in women; and are lower in Hispanics,



VITAL STATISTICS

FIGURE 13.1 Reported physical activity by American adults, 1997–2006.

SOURCE: Physical Activity Guidelines Advisory Committee, 2008. *Physical Activity Guidelines Advisory Committee Report, 2008*, Washington, DC: U.S. Department of Health and Human Services.

American Indians, and blacks than in whites. About 40% of Americans participate in no leisure-time activity—a level that has remained steady for a decade.

- People with higher levels of education are more active than people with lower educational attainment. For example, 54% of college graduates exercise regularly, compared with 37% of high school dropouts.

- About 12% of Americans report exercising vigorously for more than 20 minutes, three times per week. However, electronic measurements of people involved in normal

daily activity showed that the actual number is closer to 3%.

Most surveys show large gaps in exercise habits among Americans of different ethnicities, socioeconomic status, and education level. Regardless of statistics, however, evidence is growing that for many Americans, becoming more physically active may be the single most important lifestyle change for promoting health and well-being. (See the box “Exercise and Total Wellness.”)

Physical Activity on a Continuum

Physical activity is any body movement carried out by the skeletal muscles that requires energy. Different types of physical activity can be arranged on a continuum based on the amount of energy they require. Quick, easy movements such as standing up or walking down a hallway require little energy or effort. More intense, sustained activities such as cycling five miles or running in a race require considerably more.

Exercise refers to a subset of physical activity—planned, structured, repetitive movement of the body intended specifically to improve or maintain physical fitness. Levels of fitness depend on such physiological factors as the heart's ability

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

When you think about exercise, do you think of only one or two of the five components of health-related fitness, such as muscular strength or body composition? If so, where do you think your ideas come from? What role do the media play in shaping your ideas about fitness?

physical activity Any body movement carried out by the skeletal muscles that requires energy.

exercise Planned, structured, repetitive movement of the body intended to improve or maintain physical fitness.

TERMS



EMBRACING WELLNESS

Exercise and Total Wellness

As you will see throughout this chapter, an active lifestyle provides a multitude of benefits. For example, physically active adults live from two to four years longer, on average, than do sedentary adults. The benefits of regular physical activity,

however, go beyond longevity. They affect quality of life across multiple dimensions of wellness.

Physical Wellness

In terms of general health, exercise increases your physical capacity so that you are better able to meet the challenges of daily life with energy and vigor. Physical activity can help you do the following:

- Generate more energy.
- Increase your stamina.
- Control your weight.
- Manage stress.
- Boost your immune system.

Over the long term, even moderate physical activity can help you avoid illnesses such as heart disease, diabetes, high blood pressure, depression, osteoporosis, and some cancers. Evidence shows that exercise can even prevent premature death from many causes. Some exercise is better than none, so do something active today!

Emotional Wellness

Exercise provides psychological and emotional benefits, contributing to your sense of competence and well-being. People who

focus on staying active can also enjoy an improved self-image and a higher level of self-confidence. Such healthy self-esteem can positively affect other aspects of your life, as well. For example, a good self-image can be helpful when dealing with others or when competing.

Intellectual Wellness

Recent studies indicate that regular exercise is good for the brain—literally. Brain volume actually increases in adults who exercise regularly. Such gains in brain mass (growth or replenishment of brain matter) can improve cognitive functions and the overall health of the nervous system. Additionally, the process of mastering physical challenges—such as learning a proper golf swing—can boost intellectual fitness in the same manner as solving puzzles or engaging in other learning experiences.

Interpersonal Wellness

Joining in physical activity with a friend or a group can be a boon to your interpersonal or social wellness, too. By sharing physical challenges with others, you can make new friends, deepen your existing relationships, and build a stronger overall network of support.



connect
ACTIVITY
DO IT ONLINE

to pump blood and the size of muscle fibers. These factors are a function both of genetics—a person's inborn potential for physical fitness—and of behavior—the amount of exercise a person does to improve fitness. To develop fitness, a person must perform enough physical activity to stress the body and cause long-term physiological changes.

Moderate-intensity physical activity is essential to health and confers wide-ranging health benefits, but more intense exercise is necessary to improve physical fitness. This important distinction between physical activity and exercise is a key concept in understanding the guidelines discussed in this chapter.

Increasing Physical Activity

In 2011 the American College of Sports Medicine (ACSM) released the newest version of its exercise guidelines for healthy adults. This followed the 2010 U.S. Surgeon General report overweight and obesity in American children and

adults, *The Surgeon General's Vision for a Healthy and Fit Nation*, and the landmark 2008 report from the U.S. Department of Health and Human Services, *Physical Activity Guidelines for Americans*. Although each of these reports has a somewhat different focus, they all stress the importance of regular physical activity for health, wellness, and the prevention of chronic diseases and premature death. The 2008 guidelines include the following key recommendations for adults:

- For substantial health benefits, adults should do at least 150 minutes (2½ hours) a week of moderate-intensity aerobic physical activity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Activity should preferably be spread throughout the week.
- For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300

minutes (5 hours) a week of moderate-intensity activity, or 150 minutes (2½ hours) a week of vigorous-intensity activity, or an equivalent combination of moderate- and vigorous-intensity activity. Adults can enjoy additional health benefits by engaging in physical activity beyond this amount.

- Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on two or more days a week; these activities provide additional health benefits.

- Everyone should avoid inactivity. Adults, teenagers, and children should spend less time in front of a television or computer screen because it decreases metabolic health and contributes to a sedentary lifestyle and increases the risk of obesity.

The reports state that physical activity benefits people of all ages and of all racial and ethnic groups, including people with disabilities. The reports emphasize that the benefits of activity outweigh the dangers.

These levels of physical activity promote health and wellness by lowering the risk of high blood pressure, stroke, heart disease, type 2 diabetes, colon cancer, and osteoporosis and by reducing feelings of mild to moderate depression and anxiety.

What's the difference between moderate- and vigorous-intensity physical activity? *Physical Activity Guidelines for Americans* defines moderate-intensity physical activity as activity that causes a noticeable increase in heart rate, such as brisk walking. Vigorous-intensity physical activity is activity that causes rapid breathing and a substantial increase in heart rate, such as jogging. Figure 13.2 shows examples of moderate activities. Brisk walking, dancing, swimming, cycling, and yardwork can all help you meet the physical activity recommendations. You can burn the same number of calories by

Activity	Duration (min.)	
Washing a car	45–60	Less Vigorous, More Time
Washing windows or floors	45–60	
Volleyball	45	
Touch football	30–45	
Gardening	30–45	
Wheeling self in wheelchair	30–40	
Walking 1¾ miles	35 (20 min/mile)	
Shooting a basketball	30	
Bicycling 5 miles	30 (6 min/mile)	
Dancing fast	30	
Pushing a stroller 1½ miles	30	More Vigorous, Less Time
Raking leaves	30	
Walking 2 miles	30 (15 min/mile)	
Water aerobics	30	
Swimming laps	20	
Wheelchair basketball	20	
Playing a game of basketball	15–20	
Bicycling 4 miles	15 (3¾ min/mile)	
Jumping rope	15	
Running 1½ miles	15 (10 min/mile)	
Shoveling snow	15	
Stairwalking	15	

FIGURE 13.2 Examples of moderate amounts of physical activity. Each example uses about 150 calories.

SOURCE: Department of Health and Human Services. 1996. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta: DHHS.

doing a moderate-intensity activity for a longer time or higher-intensity activity for a shorter time. For more examples of moderate and vigorous activities, see Table 13.1. Table 13.2 summarizes the physical activity recommendations from the 2008 DHHS report. There are separate recommendations for promoting general health, fitness, and weight management.

Table 13.1 Examples of Moderate- and Vigorous-Intensity Exercise

MODERATE ACTIVITIES	VIGOROUS ACTIVITIES
Walking briskly	Walking briskly uphill
Cycling moderately on level terrain	Cycling on steep uphill terrain
Moderate housework:	Heavy housework:
• Scrubbing floors	• Moving furniture
• Washing windows	• Carrying heavy objects upstairs
Moderate yardwork or home activities:	Vigorous yardwork or home activities:
• Planting	• Shoveling snow
• Raking	• Trimming trees
• Painting	• Doing construction work
• Washing car	• Digging
Fitness activities requiring moderate effort:	Fitness activities requiring vigorous effort:
• Doing low-impact aerobics	• Running
• Playing Frisbee	• Doing high-impact aerobics
• Swimming	• Doing circuit weight training
• Playing doubles tennis	• Swimming laps
	• Playing doubles tennis

Table 13.2**Physical Activity and Exercise Recommendations for Promoting General Health, Fitness, and Weight Management**

GOAL	RECOMMENDATION
General health	Perform moderate-intensity aerobic physical activity for at least 150 minutes per week or 75 minutes of vigorous-intensity physical activity per week. Examples of moderate-intensity physical activity include brisk walking, water aerobics, tennis (doubles), dancing, and cycling less than 10 miles per hour. Examples of vigorous-intensity physical activity include jogging, power-walking, tennis (singles), jumping rope, hiking uphill, and cycling faster than 10 miles per hour. Also, be more active in your daily life: walk instead of driving, take the stairs instead of the elevator, and watch less television.
Increased health and fitness benefits	Exercise at a moderate intensity for 300 minutes per week or at a vigorous intensity for 150 minutes per week.
Achieve or maintain weight loss	Exercise at a moderate intensity for 60–90 minutes per day on most days of the week.
Muscle strength and endurance	Perform one or more sets of resistance exercises that work the major muscle groups for 8–12 repetitions (10–15 reps for older adults) on two or three nonconsecutive days per week. Examples include weight training and exercises that use body weight as resistance (such as core-stabilizing exercises, pull-ups, push-ups, lunges, and squats).
Flexibility	Perform range-of-motion (stretching) exercises at least two days per week. Hold each stretch for 10–30 seconds.
Neuromuscular training	Older people should do balance training two or three days per week. Examples include yoga, tai chi, and balance exercises (standing on one foot, step-ups, and walking lunges). These exercises are probably beneficial for young and middle-aged adults.

SOURCES: Garber, C. E., et al. 2011. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Medicine & Science in Sports & Exercise*. 43(7):1334–1359. Physical Activity Guidelines Advisory Committee. 2008. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: U.S. Department of Health and Human Services; U.S. Department of Health and Human Services. 2010. *The Surgeon General's Vision for a Healthy and Fit Nation*. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General.

The daily total of physical activity can be accumulated in multiple bouts of 10 or more minutes—for example, two 10-minute bike rides to and from class and a brisk 10-minute walk to the store. In this lifestyle approach to physical activity, people can choose activities that they find enjoyable and that fit into their daily routine. Everyday tasks at school, work, and home can be structured to contribute to the daily activity total (see the box “Making Time for Physical Activity”). If all Americans who are currently sedentary were to increase their lifestyle physical activity to 150 minutes per week, there would be an enormous benefit to public health and individual well-being.

Increasing Physical Activity to Manage Weight

Because two-thirds of Americans are overweight, the U.S. Department of Health and Human Services also published physical activity guidelines focusing on weight management. These guidelines recognize that for people who need to prevent weight gain, lose weight, or maintain weight loss, 150 minutes per week of physical activity may not be enough. Instead they recommend up to 90 minutes of physical activity per day.

Exercising to Improve Physical Fitness As mentioned earlier, moderate physical activity confers significant health and wellness benefits, especially for those who are currently

sedentary and become moderately active. However, people can obtain even greater health and wellness benefits by increasing the duration and intensity of physical activity. With increased activity, they will see more improvements in quality of life and greater reductions in disease and mortality risk.

More vigorous activity—as in a structured, systematic exercise program—is also needed to improve physical fitness; moderate physical activity alone is not enough. Physical fitness requires more intense movement that poses a substantially greater challenge to the body.

Classifying Activity Levels Assessing your activity level is easier if you know how to classify different kinds of activities (see Table 13.1). Experts define two levels of physical activity for improving health and fitness:

- **Moderate activity** causes your breathing and heart rate to accelerate but still allows for comfortable conversation, such as walking at 3–4 miles per hour. It is sometimes described as activity that can be performed comfortably for about 45 minutes. Raking leaves is an example of moderate physical activity.

- **Vigorous activity** elevates your heart rate considerably and has other physical effects that improve your fitness level. During vigorous activity, you breathe too heavily to hold a conversation easily. An example is walking faster than 4 miles per hour.

QUICK STATS

27% of adult Americans participate in leisure-time strength-training activities.

—CDC, 2009

TAKE CHARGE Making Time for Physical Activity



“Too little time” is a common excuse for not being physically active. Learning to manage your time successfully is crucial if you are to maintain a wellness lifestyle. Begin by keeping a record of how you currently spend your time. List each type of activity and the total time you engaged in it on a given day—for example, sleeping, 7 hours; eating, 1.5 hours; studying, 3 hours; and so on. Prioritize your activities according to how important they are to you, from essential to somewhat important to not important at all.

Make changes in your daily schedule by subtracting time from some activities in order to make time for physical activity. Look carefully at your leisure-time activities and your methods of transportation—these are areas where it is easy to build in physical activity. For example, you may choose to reduce the total amount of time you spend playing computer games to make time for an after-dinner bike ride or a walk with a friend. You may decide to watch 10 fewer minutes of television in the morning to change your 5-minute drive to class into a 15-minute walk.

Here are just a few ways to incorporate more physical activity into your daily routine:

- Take the stairs instead of the elevator or escalator.
- Walk to the mailbox, post office, store, bank, or library whenever possible.

- Do at least one chore every day that requires physical activity: wash the windows or your car, clean your room or house, mow the lawn, or rake the leaves.
- Take study or work breaks to avoid sitting for more than 30 minutes at a time. Get up and walk around the library, your office, or your home or dorm; go up and down a flight of stairs.
- When you take public transportation, get off one stop early and walk to your destination.
- Take the dog for a walk every day.
- If weather or neighborhood safety rule out walking outside, look for alternative locations—an indoor track, an enclosed shopping mall, or even a long hallway.
- Seize every opportunity to get up and walk around. Move more and sit less.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Does your current lifestyle include enough physical activity—150 minutes of moderate-intensity activity a week—to support health and wellness? Do you go beyond this level to include enough vigorous activity and exercise to build physical fitness? What changes could you make in your lifestyle to start developing physical fitness?

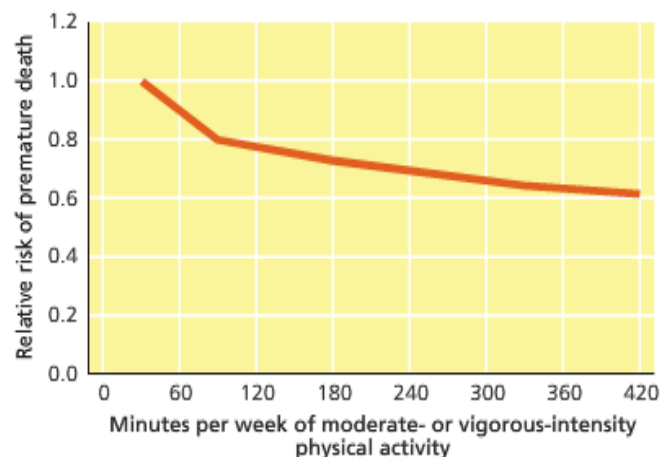
THE BENEFITS OF EXERCISE

As mentioned earlier, the human body is very adaptable. The greater the demands made on it, the more it adjusts to meet the demands—it becomes fit. Over time, immediate, short-term adjustments translate into long-term changes and improvements. (See page T1-4 of the color transparency insert “Touring Lifestyle Behaviors” in Chapter 10) The goal of regular physical activity is to bring about these kinds of long-term changes and improvements in the body’s functioning.

Reduced Risk of Premature Death

Physically active people have a reduced risk of dying prematurely from all causes, with the greatest benefits found in

the most active people (Figure 13.3). Physical inactivity increases the risk of premature death and is as important a risk factor as smoking, high blood pressure, obesity, and diabetes. Poor muscle strength also increases the risk of premature death.



VITAL STATISTICS

FIGURE 13.3 Relationship between amount of physical activity and risk of death.

SOURCE: Physical Activity Guidelines Advisory Committee. 2008. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: U.S. Department of Health and Human Services.

Improved Cardiorespiratory Functioning

Every time you take a breath, oxygen in the air enters your lungs and is picked up by red blood cells and transported to your heart. From there, the heart pumps oxygenated blood throughout the body to organs and tissues that use it. During exercise, the cardiorespiratory system (heart, lungs, and circulatory system) must work harder to meet the body's increased demand for oxygen. Regular cardiorespiratory endurance exercise improves the functioning of the heart and the ability of the cardiorespiratory system to carry oxygen to body tissues. Exercise directly affects the health of your arteries, keeping them from stiffening or clogging with plaque and reducing the risk of cardiovascular disease. Exercise also improves sexual function and general vitality.

More Efficient Metabolism and Improved Cell Health

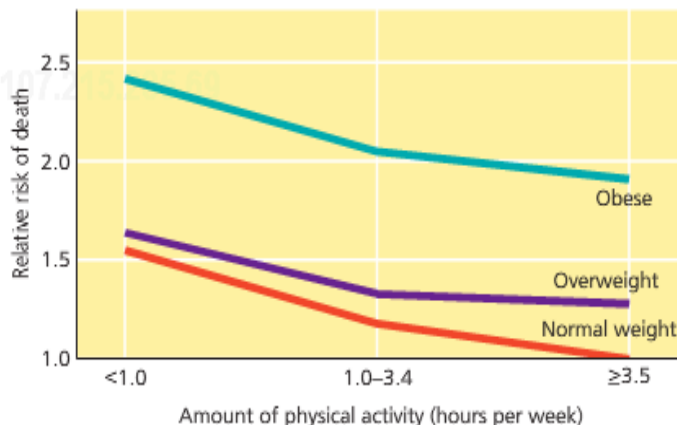
Endurance exercise improves metabolism—the process that converts food to energy and builds tissue. This process involves oxygen, nutrients, hormones, and enzymes. A physically fit person's body can more efficiently use energy from carbohydrates and fats and better regulate hormones. Exercise may also protect cells from damage from free radicals, which are destructive chemicals produced normally during metabolism (see Chapter 12), and from inflammation caused by obesity, high blood pressure or cholesterol, nicotine, and overeating. Training activates antioxidants that prevent free radical damage and maintain cell health. Regular physical activity prevents the deterioration of telomeres, which form the protective ends of chromosomes that are vital for cell health and repair.

Any increase in physical activity will contribute to your health and well-being.

Improved Body Composition

Healthy body composition means that the body has a high proportion of fat-free mass and a relatively small proportion of fat. Too much body fat, particularly abdominal fat, is linked to a variety of health problems, including heart disease, high blood pressure, cancer, and diabetes. Healthy body composition can be difficult to achieve and maintain because a diet that contains enough essential nutrients can be relatively high in calories, especially for someone who is sedentary. Excess calories are stored in the body as fat.

Exercise can improve body composition in several ways. Endurance exercise significantly increases daily calorie expenditure. It can also slightly raise *metabolic rate*, the rate at which the body burns calories, for several hours after an exercise session. Strength training increases muscle mass, thereby tipping the body composition ratio toward fat-free mass and away from fat. It can also help with losing fat because metabolic rate is directly proportional to fat-free mass: the more muscle mass, the higher the metabolic rate.



VITAL STATISTICS

FIGURE 13.4 Relationship among amount of physical activity, body weight, and risk of death.

SOURCE: Hu, F. B., et al. 2004. Adiposity compared with physical activity in predicting mortality among women. *New England Journal of Medicine* 351(26): 2694–2703.

Physical activity reduces the risk of death regardless of its effect on body composition. That is, greater levels of activity are associated with lower death rates among people who are overweight or obese as well as people who are at a healthy weight (Figure 13.4). Physical activity does not eliminate the health risks associated with overweight, but it reduces its effects.

Disease Prevention and Management

Regular physical activity lowers your risk of many chronic, disabling diseases.

Cardiovascular Disease A sedentary lifestyle is one of the six major risk factors for cardiovascular disease (CVD), including heart attack and stroke. The other major risk factors are smoking, abnormal blood fats, high blood pressure, diabetes, and obesity. Most of these risk factors are linked by a group of symptoms that scientists call the *metabolic syndrome*. These symptoms include insulin resistance, high blood pressure, abnormal blood fats, abdominal fat deposits, type 2 diabetes, blood clotting abnormalities, and blood vessel inflammation. Sedentary people have CVD death rates significantly higher than those of fit individuals. Physical inactivity increases the risk of CVD by as much as 240%. (See Chapter 15 for an in-depth discussion of cardiovascular disease and its risk factors.)

The benefits of physical activity begin at moderate levels of exercise and increase as the amount and intensity of activity rises. Exercise positively affects the risk factors for CVD, including cholesterol levels, insulin resistance, and blood pressure. Exercise also directly interferes with the disease process itself, lowering the risk of heart disease and stroke.

BLOOD FAT LEVELS High concentrations of lipids (fats), such as cholesterol and triglycerides, are linked to heart disease because they contribute to the formation of fatty deposits on the linings of arteries. When blood clots block a narrowed artery, a heart attack or stroke can occur.

Cholesterol is carried in the blood by lipoproteins, which are classified according to size and density. Cholesterol carried by low-density lipoproteins (LDLs) sticks to the walls of coronary arteries. High-density lipoproteins (HDLs) pick up excess cholesterol in the bloodstream and carry it back to the liver for excretion from the body. High LDL levels and low HDL levels increase the risk of cardiovascular disease. High levels of HDL and low levels of LDL are associated with lower risk.

Cardiorespiratory endurance exercise and strength training influence blood lipids in a positive way by increasing HDL and decreasing LDL and triglycerides—reducing the risk of CVD.

HIGH BLOOD PRESSURE Regular cardiorespiratory endurance exercise tends to reduce high blood pressure (hypertension), a contributing factor in diseases such as coronary heart disease, stroke, heart failure, kidney failure, sexual dysfunction, and blindness. Intense, long-duration exercise works best, but even moderate exercise can produce significant improvements. Strength training also reduces resting blood pressure.

CORONARY HEART DISEASE Coronary heart disease (CHD) involves blockage of one of the coronary arteries. These blood vessels supply the heart with oxygenated blood. An obstruction in a coronary artery can cause a heart attack. Exercise directly interferes with the disease process that causes coronary artery blockage. It also enhances the function of cells lining the arteries that help regulate blood flow.

STROKE A stroke occurs when a blood vessel leading to the brain is blocked, often through the same disease process that leads to heart attacks. Regular exercise reduces the risk of stroke.

Cancer Studies have shown a relationship between increased physical activity and a reduced risk of cancer, but these findings are not conclusive. There is evidence that exercise reduces the risk of colon cancer and promising data that it reduces the risk of cancer of the breast and reproductive organs in women and prostate cancer in men. Exercise may decrease the risk of colon cancer by speeding the movement of food through the gastrointestinal tract (quickly eliminating potential carcinogens), lowering blood insulin levels, enhancing immune function, and reducing blood fats. The protective mechanism in the case of reproductive system cancers is less clear, but physical activity during the high school and college years may be particularly important for preventing breast cancer later in life. Some studies have also found that regular physical activity reduces the risk of pancreatic cancer.

QUICK STATS

70,551
Americans died
of diabetes in 2008,
making it the
7th leading cause
of death that year.

—CDC, 2011

Osteoporosis A special benefit of exercise, especially for women, is protection against osteoporosis, a disease that results in loss of bone density and poor bone strength. Weight-bearing exercise, which includes almost everything except swimming, helps build bone during childhood and the teens and twenties. Older people with denser bones can better endure the bone loss that occurs with aging. Strength training and impact exercises such as jumping rope can increase bone density throughout life. With stronger bones and muscles and better balance, fit people are less likely to experience debilitating falls and bone fractures. Along with exercise, a well-balanced diet containing adequate calcium and vitamin D and normal hormone function are also essential for strong bones. (One caution: Too much exercise can depress levels of estrogen, which helps maintain bone density, thereby leading to bone loss, even in young women.)

Type 2 Diabetes People with diabetes are prone to heart disease, blindness, and severe problems of the nervous and circulatory systems. Exercise prevents the development of type 2 diabetes, the most common form of the disease. Exercise burns excess sugar and makes cells more sensitive to insulin. Exercise also helps keep body fat at healthy levels, which is important because obesity is a key risk factor for type 2 diabetes. For people who have diabetes, physical activity is an important part of treatment. See Chapter 14 for more about diabetes.

Improved Psychological and Emotional Wellness

Physically active people enjoy many social, psychological, and emotional benefits, including the following:

- **Reduced anxiety.** Exercise reduces symptoms of anxiety, such as worry and self-doubt, both in people who are anxious most of the time and in people who become anxious in response to a particular experience. Exercise is associated with a lower risk for panic attacks, generalized anxiety disorder, and social anxiety disorder.
- **Reduced depression and improved mood.** Exercise relieves feelings of sadness and hopelessness and can be as effective as psychotherapy in treating mild to moderate cases of depression. Exercise improves mood and increases feelings of well-being in both depressed and nondepressed people.
- **Improved sleep.** Regular physical activity helps people fall asleep more easily; it also improves sleep quality.
- **Reduced stress.** Exercise reduces the body's overall response to all forms of stressors and helps people deal more effectively with stress.
- **Enhanced self-esteem, self-confidence, and self-efficacy.** Exercise can boost self-esteem and self-confidence by providing



Because exercise improves workers' quality of work and mental and physical abilities, many large companies provide on-site fitness facilities or gym memberships as employee benefits.

opportunities for people to succeed and excel. Exercise also improves body image. Sticking with an exercise program increases people's belief in their ability to be active, thereby boosting self-efficacy.

- **Enhanced creativity and intellectual functioning.** In studies of people of all ages, physically active people score higher on tests of creativity and mental function than sedentary people. Exercise improves alertness and memory in the short term. Over time, exercise helps maintain reaction time, short-term memory, and nonverbal reasoning skills and enhances brain metabolism.
- **Improved work productivity.** Studies show that workers' quality of work, time management abilities, and mental and interpersonal performance are better on days they exercise.
- **Increased opportunities for social interaction.** Exercise provides many chances for people to have positive interactions with other people.

Improved Immune Function

Exercise can have either positive or negative effects on the immune system—the physiological processes that protect us from disease. Moderate endurance exercise boosts immune function, whereas excessive training depresses it. Physically fit people get fewer colds and upper respiratory tract infections than people who are not fit. The immune system and ways to strengthen it are discussed further in Chapter 17.

Prevention of Injuries and Low-Back Pain

Increased muscle strength provides protection against injury because it helps people maintain spinal stability, good posture, and appropriate body mechanics when performing

everyday activities such as walking, lifting, and carrying. Good muscle endurance in the abdomen, hips, lower back, and legs supports the back in proper alignment and helps prevent low-back pain, which afflicts more than 85% of Americans at some time in their lives.

Improved Wellness for Life

Although people differ in the maximum levels of fitness they can achieve through exercise, the wellness benefits of exercise are available to everyone (see the box “Exercise for People with Special Health Concerns”). Exercising regularly may be the single most important thing you can do now to improve the quality of your life in the future. All the benefits of exercise continue to accrue but gain new importance as the resilience of youth begins to wane. Simply stated, exercising can help you live a longer and healthier life.

DESIGNING YOUR EXERCISE PROGRAM

The best exercise program has two primary characteristics: it promotes your health, and it's fun for you to do. Exercise can provide some of the most pleasurable moments of your day, once you make it a habit. A little thought and planning will help you achieve these goals.

Figure 13.5 shows a physical activity pyramid to guide you in meeting goals for physical activity. If you are sedentary, start at the bottom of the pyramid and gradually increase the moderate-intensity physical activity in your daily life. You don't have to exercise vigorously, but you should experience a moderate increase in your heart and breathing rates; appropriate activities include walking, climbing stairs, doing yardwork, and washing your car. As mentioned earlier, your activity time can be broken up into small blocks during the day. Work up to meeting the goal of 150 minutes of moderate-intensity exercise per week. Choose to be active whenever you can. If weight management is a concern for you, begin by achieving the goal of 150 minutes per week and then gradually increase your activity level to 300 minutes per week while reducing caloric intake. Tables 13.1 and 13.2 summarize physical activity recommendations for improving health and fitness.

For even greater benefits, move up to the next two levels of the pyramid, which illustrate parts of a formal exercise program. The American College of Sports Medicine has established guidelines for an exercise program that includes cardiorespiratory endurance (aerobic) exercise, strength training, flexibility training, and balance training (for older adults) (Table 13.2). Such a program will develop all the health-related components of physical fitness. The following sections of this chapter will show you how to develop a personalized exercise program. For a summary of the health and fitness benefits of different levels of physical activity, see Figure 13.6.

DIVERSITY MATTERS

Exercise for People with Special Health Concerns



If you have a special health concern and hesitate to become more active, one helpful strategy is to take a class or join an exercise group specifically designed for your condition. Many health centers and support groups sponsor specially tailored programs. A class or group activity can provide you with expert advice and exercise partners who share your concerns and goals. If you prefer to exercise at home, exercise videos are available for people with a variety of conditions.

The fitness recommendations for the general population presented in this chapter can serve as general guidelines for any exercise program. However, for people with special health concerns, certain precautions and monitoring may be required. *Anyone with special health concerns should consult a physician before beginning an exercise program.*

Asthma

- Carry medication during workouts and avoid exercising alone. Use your inhaler before exercise, if recommended by your physician.
- Exercise regularly, and warm up and cool down slowly to reduce the risk of acute attacks.
- When starting a fitness program, choose self-paced endurance activities, especially those involving interval training (short bouts of exercise followed by rest periods).
- When possible, avoid circumstances that may trigger an asthma attack, including dust, pollen, or cold dry air. Drink water to keep your airways moist, and in cold weather, cover your mouth with a mask or scarf to warm and humidify the air you breathe.
- Swimming is a good activity for people with asthma.

Diabetes

- Don't exercise alone.
- Wear a bracelet or necklace that identifies you as a diabetic.
- If you take insulin or another medication, you may need to adjust the timing and amount of each dose as you learn to balance your energy intake and output and your medication dosage.

- To prevent abnormally rapid absorption of injected insulin, inject it over a muscle that won't be exercised and wait at least an hour after injection before exercising.

- Check blood sugar levels before, during, and after exercise, and adjust your diet or insulin dosage if needed.

- Avoid exercise if your blood sugar level is above 250 mg/dl, and ingest carbohydrates prior to exercise if your blood sugar level is below 100 mg/dl. Keep high-carbohydrate foods available during a workout.

- Check your skin regularly for blisters and abrasions, especially on your feet.

Obesity

- For maximum benefit and minimum risk, start with low- to moderate-intensity activities and increase intensity slowly as fitness improves.
- To lose weight or maintain lost weight, exercise moderately for 30–60 minutes or more daily and reduce food intake. You can exercise all at once or divide your total activity time into sessions of 10 or more minutes.
- Start your program with non- or low-weight-bearing activities like swimming, water exercises, cycling, or walking.
- Stay alert for symptoms of heat-related problems during exercise.
- Include as much lifestyle physical activity in your daily routine as possible.
- Add strength training to your program to build or maintain muscle mass.

Heart Disease and Hypertension

- Warm-ups and cool-downs should be gradual and last at least 10 minutes.
- Exercise at a moderate rather than high intensity. Monitor your heart rate during exercise, and stop if you experience dizziness or chest pain.
- Increase exercise frequency, intensity, and time very gradually.
- Don't hold your breath and strain when exercising. This can cause a sudden, steep increase in blood pressure.
- Discuss the effects of your medication with your physician (certain drugs for



hypertension affect heart rate). If your physician has prescribed nitroglycerine, keep it with you during exercise.

Arthritis

- Begin an exercise program as early as possible in the course of the disease.
- Warm up thoroughly before each workout to loosen stiff muscles and lower the risk of injury.
- Avoid high-impact activities that may damage arthritic joints. Swimming or water aerobics may be good choices for someone with arthritis.
- In strength training, pay special attention to muscles that support and protect affected joints. Add weight very gradually.
- Do flexibility exercises regularly.

Osteoporosis

- If possible, choose low-impact, weight-bearing activities to help safely maintain bone density.
- To prevent fractures, avoid any activity or movement that stresses the back or carries a risk of falling.
- Weight-train to improve strength and balance and to reduce the risk of falls and fractures, but avoid lifting heavy weights.



FIGURE 13.5 Physical activity pyramid.

First Steps

Are you thinking about starting a formal exercise program? A little planning can help make it a success.

Medical Clearance Previously inactive men over 40 and women over 50 should get a medical examination before beginning an exercise program. Diabetes, asthma, heart disease, and extreme obesity are conditions that may call for a modified program. If you have an increased risk of heart disease because of smoking, high blood pressure, or obesity, get a physical checkup, including an **electrocardiogram (ECG or EKG)**, before beginning an exercise program.

Basic Principles of Physical Training To put together an effective exercise program, you should first understand the basic principles of physical training.

SPECIFICITY To develop a fitness component, you must perform exercises that are specifically designed for that component. This is the principle of **specificity**. Weight training, for example, develops muscular strength but is less effective for developing flexibility or cardiorespiratory endurance. Specificity

also applies to the skill-related fitness components and to the different parts of the body. A well-rounded exercise program includes exercises geared to each component of fitness, to different parts of the body, and to specific activities or sports.

PROGRESSIVE OVERLOAD Your body adapts to the demands of exercise by improving its functioning. When the amount of exercise, or overload, is progressively increased, fitness continues to improve. This training principle is called **progressive overload**. Too little exercise has no effect on fitness; too much may cause injury. The appropriate amount depends on your current level of fitness, your genetic capacity to adapt to exercise, your fitness goals, and the fitness components being developed.

The amount of overload needed to maintain or improve a particular level of fitness is determined in four dimensions, represented by the acronym FITT:

Frequency
Intensity
Time
Type

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Which benefits of exercise are most important to you, and why? For example, is there a history of heart disease or diabetes in your family? Have you thought about how regular exercise could reduce your risks for specific diseases?

TERMS

electrocardiogram (ECG or EKG) A recording of the changes in electrical activity of the heart.

specificity The training principle that the body adapts to the particular type and amount of stress placed on it.

progressive overload The training principle that placing increasing amounts of stress (in the form of exercise) on the body causes adaptations that improve fitness.

	 Lifestyle physical activity	 Moderate exercise program	 Vigorous exercise program
Description	Moderate physical activity (150 minutes per week; muscle-strengthening exercises 2 or more days per week)	Cardiorespiratory endurance exercise (20–60 minutes, 3–5 days per week); strength training (2–3 nonconsecutive days per week); and stretching exercises (2 or more days per week)	Cardiorespiratory endurance exercise (20–60 minutes, 3–5 days per week); interval training; strength training (3–4 nonconsecutive days per week); and stretching exercises (5–7 days per week)
Sample activities or program	<i>One of the following:</i> - Walking to and from work, 15 minutes each way - Cycling to and from class, 10 minutes each way - Yard work for 30 minutes - Dancing (fast) for 30 minutes - Playing basketball for 20 minutes	- Jogging for 30 minutes, 3 days per week - Weight training, 1 set of 8 exercises, 2 days per week - Stretching exercises, 3 days per week	- Running for 45 minutes, 3 days per week - Intervals: running 400 m at high effort, 4 sets, 2 days per week - Weight training, 3 sets of 10 exercises, 3 days per week - Stretching exercises, 6 days per week
Health and fitness benefits	Better blood cholesterol levels, reduced body fat, better control of blood pressure, improved metabolic health, and enhanced glucose metabolism; improved quality of life; reduced risk of some chronic diseases. Greater amounts of activity can help prevent weight gain and promote weight loss.	All the benefits of lifestyle physical activity, plus improved physical fitness (increased cardiorespiratory endurance, muscular strength and endurance, and flexibility) and even greater improvements in health and quality of life and reductions in chronic disease risk.	All the benefits of lifestyle physical activity and a moderate exercise program, with greater increases in fitness and somewhat greater reductions in chronic disease risk. Participating in a vigorous exercise program may increase risk of injury and overtraining.

FIGURE 13.6 Health and fitness benefits of different amounts of physical activity and exercise.

- **Frequency, or how often.** Optimal exercise frequency, expressed in number of days per week, varies with the component being developed, how vigorously you exercise, and your goals. A frequency of 3–5 days per week is recommended for cardiorespiratory endurance exercise, 2 or 3 days per week for strength training, and 2 to 3 days per week (ideally 5 to 7 days per week) for stretching.

- **Intensity, or how hard.** Fitness benefits occur when you exercise harder than your normal level of activity. To develop cardiorespiratory endurance, you must raise your heart rate above normal; to develop muscular strength, you must lift a heavier weight than you normally do; to develop flexibility, you must stretch your muscles beyond their normal length. A gradual increase in intensity is recommended to avoid injury.

- **Time (duration), or how long.** If fitness benefits are to occur, exercise sessions must last for an extended period. Depending on the component being developed and your intensity level, a duration of 20–60 minutes is usually recommended. The Department of Health and Human Services' exercise recommendations are to accumulate at least 150 minutes per week of moderate-intensity physical activity.

- **Type, or mode of activity.** The type of exercise in which you should engage varies with each fitness component and

with your personal fitness goals. To develop cardiorespiratory endurance, you need to engage in continuous activities involving large muscle groups—walking, cycling, or swimming, for example. Resistance exercises develop muscular strength and endurance; stretching exercises build flexibility. The frequency, intensity, and time of exercise will be different for each type of activity.

REST AND RECUPERATION Fitness gains occur following exercise as the body adapts to the stress of training. Adequate rest is as important to this process as training. Overtraining—an imbalance between training and recovery—leads to injury, illness, and excessive fatigue.

REVERSIBILITY The body adjusts to lower levels of physical activity in the same way it adjusts to higher levels—this is the principle of **reversibility**. When you stop exercising, you can lose up to 50% of fitness improvements within two months. Try to exercise consistently, and don't quit if you miss a few workouts. If you must temporarily curtail your training, you can maintain

reversibility The training principle that fitness improvements are lost when demands on the body are lowered.

TERMS

your fitness improvements by keeping the intensity of your workouts constant while reducing their frequency or duration.

INDIVIDUAL DIFFERENCES There are genetic limits to how much a person can improve fitness, as well as large individual differences between people in their ability to improve fitness, achieve a desirable body composition, and perform and learn sports skills. In studies, some people on a diet and exercise program improve fitness by 50%, while others on the same program improve by only 2–3%. It is more difficult for those whose bodies don't respond as well to exercise to make changes in fitness or body fat levels. Elite athletes start out with a genetic advantage over the average person. However, everyone has the capacity to improve fitness and reap the health benefits of exercise.

Responders and Nonresponders to Exercise Per-Olaf Åstrand, a famous physiology professor from Sweden, once said, “Choose your parents very carefully if you want to be an Olympic champion.” Elite athletes are genetically gifted men and women, but genetics also influence the capacity of the average person to improve his or her physical fitness. The Human Genome Project, completed in 2002, identified the human gene sequences related to athletic performance. Athletic performance has a strong genetic component. People show highly variable responses to the same diet or exercise program: some people improve by 50% while others improve only 2–3%. It is more difficult for nonresponders than for responders to make changes in fitness or in body fat levels. Almost everyone, however, receives health benefits from exercise.

Selecting Activities If you have been inactive, begin by gradually increasing the amount of moderate physical activity in your life (the bottom of the activity pyramid shown in Figure 13.5). Once your body adjusts to your new level of activity, you can choose additional activities for your exercise program.

Be sure the activities you choose contribute to your overall wellness and make sense for you. Are you competitive? If so, try racquetball, basketball, or squash. Do you prefer to exercise alone? Then consider cross-country skiing or road running. Have you been sedentary? A walking program may be a good place to start. If you think you may have trouble sticking with an exercise program, find a structured activity that you can do with a friend, a personal trainer, or a group.

Be realistic about the constraints presented by some sports, such as accessibility, expense, and time. For example, if you have to travel for hours to get to a ski area, skiing may not be a good choice for your regular exercise program. And if you've never played tennis, it will probably take some time to reach a reasonable skill level; you may be better off with a program of walking or jogging to get good workouts while you're improving your tennis game.

Choose activities that contribute to your overall wellness and make sense for you.

Cardiorespiratory Endurance Exercise

Exercises that condition your heart and lungs and improve your metabolism should have a central role in your fitness

program. The best exercises for developing cardiorespiratory endurance stress a large portion of the body's muscle mass for a prolonged period of time. These include walking, jogging, running, swimming, bicycling, and aerobic dancing. Many popular sports and recreational activities, such as racquetball, tennis, basketball, and soccer, are also good if the skill level and intensity of the game provide a vigorous workout.

Frequency The optimal workout schedule for endurance training is 3–5 days per week. Beginners should start with 3 days and work up to 5 days. Training more than 5 days a week often leads to injury for recreational athletes. Although you get health benefits from exercising vigorously only 1 or 2 days per week, you risk injury because your body never gets a chance to adapt fully to regular exercise training.

Intensity The most misunderstood aspect of conditioning, even among experienced athletes, is training intensity. Intensity is the crucial factor in attaining a significant training effect—that is, in increasing the body's cardiorespiratory capacity. A primary purpose of endurance training is to increase **maximal oxygen consumption** ($\dot{V}O_{2max}$). $\dot{V}O_{2max}$ represents the cells' maximum ability to use oxygen and is considered the best measure of cardiorespiratory capacity. Intensity of training is the crucial factor in improving $\dot{V}O_{2max}$.

One of the easiest ways to determine exactly how intensely you should work involves measuring your heart rate. It is not necessary or desirable to exercise at your maximum heart rate—the fastest heart rate possible before exhaustion sets in—to improve your cardiorespiratory capacity. Beneficial effects occur at lower heart rates with a much lower risk of injury. **Target heart rate range** is the range of rates within which you should exercise to obtain cardiorespiratory benefits. To determine the intensity at which you should exercise, see the box “Determining Your Target Heart Rate Range” and Figure 13.7.

After you begin your fitness program, you may improve quickly because the body adapts readily to new exercises. The rate of improvement may slow after the first month or so. The more fit you become, the harder you will have to work to improve. By monitoring your heart rate, you will always know if you are working hard enough to improve, not hard enough, or too hard. For most people, a fitness program involves attaining an acceptable level of fitness and then maintaining that level. There is no need to keep working indefinitely to improve; doing so only increases

maximal oxygen consumption ($\dot{V}O_{2max}$) The body's maximum ability to transport and use oxygen.

TERMS

target heart rate range The range of heart rates that should be reached and maintained during cardiorespiratory endurance exercise to obtain benefits.

TAKE CHARGE

Determining Your Target Heart Rate Range



Your target heart rate is the range of rates at which you should exercise to experience cardiorespiratory benefits. Your target heart rate range is based on your maximum heart rate, which can be estimated from your age. If you are a serious athlete or face possible cardiovascular risks from exercise, you may want to have your maximum heart rate determined more accurately through a treadmill test in a physician's office, hospital, or sports medicine laboratory. Your target heart rate is a range: the lower value corresponds to moderate-intensity exercise, and the higher value is associated with high-intensity exercise. Target heart rate ranges are shown in the accompanying table.

You can monitor the intensity of your workouts by measuring your pulse either at your wrist or at one of your carotid arteries, located on either side of your Adam's apple. Your pulse rate drops rapidly after exercise, so begin counting immediately after you have finished exercising. You will get the most accurate results by

counting beats for 10 seconds and then multiplying by 6 to get your heart rate in beats per minute (bpm). The 10-second counts corresponding to each target heart rate range are also shown in the table.

COUNT AGE (YEARS)	TARGET HEART RATE RANGE (BPM)*	10-SECOND (BEATS)*
20–24	127–180	21–30
25–29	124–176	20–29
30–34	121–171	20–28
35–39	118–167	19–27
40–44	114–162	19–27
45–49	111–158	18–26
50–54	108–153	18–25
55–59	105–149	17–24
60–64	101–144	16–24
65+	97–140	16–23

*Target heart rates lower than those shown here are appropriate for individuals with a very low initial level of fitness. Ranges are based on the following formula: Target heart rate = 0.65 to 0.90 of maximum heart rate, assuming maximum heart rate = $220 - \text{age}$.

the chance of injury. After you have reached the level you want, you can maintain fitness by exercising at the same intensity 3–5 days per week.

A heart rate monitor is an electronic device that checks the user's pulse, either continuously or on demand. Heart rate monitors make it easy to monitor your heart rate before, during, and after exercise. Some include global positioning system (GPS) receivers that help you determine your location and track the distance you walk, run, or bike.

Heart rate monitors are useful if close tracking of heart rate is important in your program. They offer several advantages:

- They are accurate, and they reduce the risk of mistakes when checking your own pulse.
- They are easy to use, although a sophisticated, multi-function monitor may take some time to master.
- They do the monitoring for you, so you don't have to worry about checking your own pulse.



FIGURE 13.7 Checking your pulse. The pulse can be taken at the carotid artery in the neck (top) or at the radial artery in the wrist (bottom).

When shopping for a heart rate monitor, do your homework. Quality, reliability, and warranties vary. Ask personal trainers for recommendations, and look for product reviews in consumer magazines or online.

Time (Duration) A total time of 20–60 minutes per workout is recommended for cardiorespiratory endurance training. Exercise can be done in a single session or several sessions lasting 10 or more minutes. The total duration of exercise depends on its intensity. To improve cardiorespiratory endurance during a moderate-intensity activity such as walking or slow swimming, you should exercise for 45–60 minutes. For high-intensity exercise performed at the top of your target heart rate zone, a duration of 20 minutes is sufficient. Start with less vigorous activities and gradually increase intensity.

Type The best exercises for developing cardiorespiratory endurance stress a large portion of the body's muscle mass for a prolonged period of time. These include walking, jogging, running, swimming, bicycling, and aerobic dance. Many popular sports and recreational activities, such as racquetball, tennis, basketball, and soccer, are also good if the skill level and intensity of the game are sufficient to provide a vigorous workout.

The Warm-Up and Cool-Down It is always important to warm up before you exercise and to cool down afterward. Warming up enhances your performance and decreases your chances of injury. Your muscles work better when their temperature is elevated slightly above resting level. Warming up helps your body progress gradually from rest to exercise. Blood needs to be redirected to active muscles, and your heart needs time to adapt to the increased demands of exercise. A warm-up bathes joints with lubricating fluid, which helps protect joint surfaces from wear and tear.

A warm-up session should include low-intensity movements similar to those in the activity that will follow. For example, hit forehands and backhands before a tennis game or jog slowly for 400 meters before progressing to an 8-minute mile. Some people like to include stretching exercises in their warm-up, but experts recommend stretching *after* the active part of your warm-up, when your body temperature is elevated. Studies have found that stretching prior to exercise can temporarily decrease muscle strength and power, so if a high-performance workout is your goal, it is best to stretch after a workout. Stretching is discussed in detail later in this chapter.

Cooling down after exercise is important to restore the body's circulation to its normal resting condition. When you are at rest, a relatively small percentage of your total blood volume is directed to muscles, but during exercise, as much as 90% of the heart's output is directed to them. During recovery from exercise, it is important to continue exercising at a low level to provide a smooth transition to the resting state. Cooling down helps regulate the return of blood to your heart. After exercising, avoid taking a hot shower until you have cooled down.

Exercises for Muscular Strength and Endurance

Any program designed to promote health should include exercises that develop muscular strength and endurance. Your ability to maintain correct posture and move efficiently depends in part on muscle fitness. Strengthening exercises also increase muscle tone, which improves the body's appearance.

Types of Strength Training Exercises Muscular strength and endurance can be developed in many ways, from weight training to calisthenics. Common exercises such as curl-ups, push-ups, pull-ups, and nonweighted squats maintain the muscular strength of most people if they practice them several times a week. To condition and tone your whole body, choose exercises that work the major muscles of the shoulders, chest, back, arms, abdomen, and legs.

To increase muscular strength and endurance, you must do **resistance exercise**—exercises in which your muscles must exert force against a significant amount of resistance. Resistance can be provided by weights, exercise machines, your own body weight, or even objects such as rocks.

Isometric (static) exercises involve applying force without movement, such as when you contract your abdominal muscles. This type of exercise is valuable for toning and strengthening muscles. Isometrics can be practiced anywhere and do not require any equipment. For maximum strength gains, hold an isometric contraction maximally for 6 seconds, and do 5–10 repetitions. Don't hold your breath: doing so can restrict blood flow to your heart and brain. Within a few weeks, you will notice the effect of this exercise. Isometrics are particularly useful when recovering from an injury.

Isotonic (dynamic) exercises involve applying force with movement, as in weight training exercises such as the bench press. These are the most popular type of exercises for in-

creasing muscle strength and seem to be most valuable for developing strength that can be transferred to other forms of physical activity. They include exercises using barbells, dumbbells, kettlebells, weight machines, and body weight (as in push-ups or curl-ups).

Core Training The core muscles include those in the abdomen, pelvic floor, sides of the trunk, back, buttocks, hips, and pelvis (see Figure 13.8). They stabilize the spine and help transfer force between the upper and lower body. They stabilize the midsection when you

QUICK STATS

5–10 minutes of warming up and cooling down are adequate for a 30-minute workout of brisk walking.

—CDC, 2011

resistance exercise Exercise that forces muscles to contract against increased resistance; also called *strength training*.

isometric (static) exercise The application of force without movement.

isotonic (dynamic) exercise The application of force with movement.

TERMS



Weight training exercises are isotonic (dynamic) exercises that involve applying force with movement.

sit, stand, reach, walk, jump, twist, squat, throw, or bend. The muscles on the front, back, and sides of your trunk support your spine when you sit in a chair and fix your midsection as you use your legs to stand up. Strong core muscles make movements more forceful and help prevent back pain.

During any dynamic movement, the core muscles and active muscles work together. Some shorten to cause movement, while others contract and hold to provide stability, lengthen to brake the movement, or send signals to the brain about the movements and positions of the muscles and bones. When specific core muscles are weak or tired, the nervous system steps in and uses other muscles. This substitution causes abnormal stress on the joints, decreases power, and increases the risk of injury.

The best exercises for low-back health are whole-body exercises that force the core muscles to stabilize the spine in many different directions. Low-back exercises that focus on the core muscles include the lunge, side bridges, and spine extensions. These exercises are generally safe for beginning exercisers and, with physician approval, people with back pain. More challenging core exercises utilize stability balls or free weights.

Gender Differences in Muscular Strength Men are generally stronger than women because their bodies are typically larger overall and a larger proportion of their total body mass is made up of muscle. But when strength is expressed per unit of muscle tissue, men are only 1–2% stronger than women in the upper body and about equal to women in the lower body. Individual muscle cells are larger in men, but the functioning of the cells is the same in both sexes.

Two factors that help explain the strength disparities between men and women are testosterone levels and the speed of nervous control of muscle. Testosterone promotes the growth of muscle tissue in both males and females, but testosterone levels are about 6–10 times higher in men than in women, so men

develop larger muscles. Also, because the male nervous system can activate muscles faster, men tend to have more power.

Most women will not develop large muscles from strength training. Resistance exercise helps women reduce their overall body fat levels and reduce fat in the midsection. Losing muscle over time is a much greater health concern for women than small gains in muscle weight in response to strength training, especially because any gains in muscle weight are typically more than balanced with loss of fat weight. Men and women lose muscle mass and power as they age, but because men start out with more muscle when they are young and don't lose power as quickly as women, older women often have greater impairment of muscle function than older men. This may partially explain the higher incidence of life-threatening falls in older women.

Choosing Equipment Many people prefer weight machines to free weights because they are safe, convenient, and easy

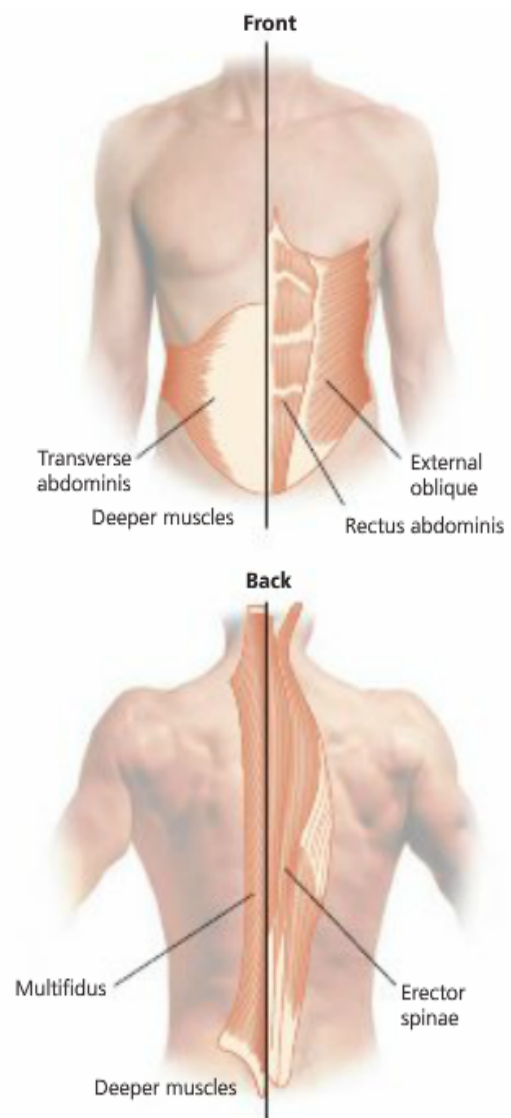


FIGURE 13.8 Major core muscles.

SOURCE: Fahey, T. D., P. M. Insel, and W. T. Roth. 2013. *Fit and Well: Core Concepts and Labs in Physical Fitness and Wellness*, 10th ed. New York: McGraw-Hill. Copyright © 2013 The McGraw-Hill Companies, Inc.



WELLNESS ON CAMPUS

Safe Weight Training

General Strategies

- Lift weights from a stabilized body position. Protect your back from dangerous positions. Don't twist your body while lifting.
- Don't lift beyond the limits of your strength.
- Be aware of what's going on around you so that you don't bump into someone or get too close to a moving weight stack.
- Don't use defective equipment. Report equipment problems immediately.
- Don't chew gum when exercising.
- *Don't hold your breath while doing weight training exercises.* Inhale when moving the weight into position, and exhale when exerting the greatest force. (Holding your breath raises blood pressure and causes a decrease in the volume of blood returning to the heart. This can make you become dizzy and faint.)
- Rest between lifts.
- Always warm up before training and cool down afterward.

Free Weights

- Use spotters to avoid injury. A spotter can help you if you cannot complete a lift or if the weight tilts.

- Use a collar to secure weight plates to barbells.
- Keep weights as close to your body as possible. Do most of your lifting with your legs; when squatting or lifting from the floor, maintain a neutral spine and hinge at the hips, not at the spine.
- Lift weights smoothly and slowly; don't bounce or jerk them. Control the weight through the entire range of motion.
- When holding barbells and dumbbells, wrap your thumbs around the bar when gripping it.
- When performing kettlebell swings and snatches, be aware of your surroundings and provide enough room so that you can let go of the kettlebell without injuring yourself or others.

Weight Machines

- Stay away from moving parts of the machine that could pinch your skin or crush your fingers.
- Adjust each machine for your body so that you don't have to work in an awkward position.
- Beware of broken bolts, frayed cables, broken chains, or loose cushions that can give way and cause serious injury.
- Make sure the machines are clean. Carry a towel with you, and place it on the machine where you will sit or lie down.

to use. You set the resistance, sit down at the machine, and start working. Free weights require more care, balance, and coordination to use, but they strengthen your body in ways that are more adaptable to real life. When using free weights, you need to use a *spotter*—someone who stands by to assist in case you lose control of a weight (see the box “Safe Weight Training”).

Choosing Exercises A complete weight training program works all the major muscle groups: neck, upper back, shoulders, arms, chest, abdomen, lower back, thighs, buttocks, and calves. Different exercises work different muscles, so it usually takes about 8–10 exercises to get a complete workout for general fitness. For example, you can do bench presses to develop the chest, shoulders, and upper arms; pull-ups to work the biceps and upper back; squats to develop the legs and buttocks; toe raises to work the calves; and so on. If you are also training for a particular sport, include exercises to strengthen the muscles that are important for optimal performance and those that are most likely to be injured. Whole body functional exercises, such as **kettlebell** swings and snatches, work many large muscle groups in the lower and upper body.

kettlebell A large iron ball with a handle attached varying in weight from about 5 pounds to more than 100 pounds; usually used to perform high-speed resistance exercises.

TERMS



Exercising with a kettlebell works large muscle groups in the upper and lower body.

Frequency For general fitness, the American College of Sports Medicine recommends a workout frequency of at least two nonconsecutive days per week. This allows your muscles one or more days of rest between workouts to avoid soreness and injury. If you enjoy weight training and would like to train more often, try working different muscle groups on alternate days.

Intensity and Time The amount of weight (resistance) you lift in weight training exercises is equivalent to intensity in cardiorespiratory endurance training, and the number of repetitions of each exercise is equivalent to time. To improve fitness, you must do enough repetitions of each exercise to temporarily fatigue your muscles. The number of repetitions needed to cause fatigue depends on the amount of resistance: the heavier the weight, the fewer repetitions to reach fatigue. In general, a heavy weight and a low number of repetitions (1–5) build strength, whereas a light weight and a high number of repetitions (10–25) build endurance. For a general fitness program to build both strength and endurance, try to do 8–12 repetitions of each exercise. For people who are over 50 years of age, 10–15 repetitions of each exercise using a lighter weight is recommended.

The first few sessions of weight training should be devoted to learning the exercises. To start, choose a weight that you can move easily through 8–12 repetitions. Add weight when you can do more than 12 repetitions of an exercise. If adding weight means you can do only 7 or 8 repetitions before your muscles fatigue, stay with that weight until you can again complete 12 repetitions. If you can do only 4–6 repetitions after adding weight, or if you can't maintain good form, you've added too much and should take some off. As a general guideline, try increases of approximately $\frac{1}{2}$ pound of additional weight for each 10 pounds you are currently lifting.

For developing strength and endurance for general fitness, a single set (a group of repetitions) of each exercise is sufficient, provided you use enough weight to fatigue your muscles. Doing more than one set of each exercise may increase strength development further, and most serious weight trainers do at least three sets of each exercise. If you do more than one set of an exercise, rest long enough between sets (1–5 minutes) to allow your muscles to recover.

You should warm up before every weight training session and cool down afterward. You can expect to improve rapidly during the first 6–10 weeks of training; gains will then come more slowly. Factors such as age, motivation, gender, and genetics will affect your progress. Your ultimate goal depends on you. After you have achieved the level of strength and muscularity that you want, you can maintain your gains by training 2–3 nonconsecutive days per week.

A Caution about Supplements No nutritional supplement or drug will change a weak person into a strong person. Those changes require regular training that stresses the

body and causes physiological adaptations. Supplements or drugs that promise quick, large gains in strength usually don't work and are often dangerous, expensive, or illegal. Over-the-counter supplements are not carefully regulated, and their long-term effects have not been systematically studied. Performance-enhancing drugs such as **anabolic steroids** and growth hormone have potentially dangerous side effects.

Flexibility Exercises

Flexibility, or stretching, exercises are important for maintaining the normal range of motion in the major joints of the

body. Some exercises, such as running, can decrease flexibility because they require only a partial range of motion. Like a good weight training program, a good stretching program includes exercises for all the major muscle groups and joints of the body: neck, shoulders, back, hips, thighs, hamstrings, and calves. In tandem with core training, flexibility training is important for preventing lower back injuries and maintaining lower back health.

Proper Stretching Technique Timing determines the best stretching technique: in general, do static stretching after a workout and dynamic or active stretching before a workout. *Static stretching* involves extending to a certain position, then holding it. *Dynamic stretching* is done by actively moving through the joints' ranges of motion. *Ballistic stretching* (known as "bouncing") is dangerous and counterproductive. The safest and most convenient technique for increasing flexibility may be active static stretching with a passive assist. For example, you might do a seated stretch of your calf muscles by contracting the muscles on the top of your shin and by grabbing your feet and pulling them toward you.

Frequency Do stretching exercises at least 2–3 days per week (but 5–7 days is optimal). If you stretch after cardiorespiratory endurance exercise or strength training, during your cool-down, you may develop more flexibility because your muscles are warmer then and can be stretched farther.

Intensity and Time For each exercise, stretch to the point of tightness in the muscle, then hold the position for 15–30 seconds. Rest for 30–60 seconds, then repeat, trying to stretch a bit farther. Relax and breathe easily as you stretch. You should feel a pleasant, mild stretch as you let the muscles relax; stretching should not be painful. Do 2–4 repetitions of each exercise. A complete flexibility workout usually takes about 20–30 minutes.

Increase your intensity gradually over time. Improved flexibility takes many months to develop. There are large

Do stretching exercises at least 2–3 days per week, but 5–7 days per week is optimal.

anabolic steroids Synthetic male hormones used to increase muscle size and strength.

TERMS



When performed regularly, stretching exercises help maintain or improve the range of motion in joints. For each exercise, stretch to the point of tightness in the muscle and hold the position for 15–30 seconds.

individual differences in joint flexibility. Don't feel you have to compete with others during stretching workouts.

Training in Specific Skills

The final component in your fitness program is learning the skills required for the sports or activities in which you choose to participate. By taking the time and effort to acquire competence, you can achieve a sense of mastery and add a new physical activity to your repertoire.

The first step in learning a new skill is getting help. Sports like tennis, golf, and skiing require mastery of basic movements

and techniques, so instruction from a qualified teacher or coach can save you hours of frustration and increase your enjoyment. Skill is also important in conditioning activities such as jogging, swimming, and cycling. Even if you learned a sport as a child, additional instruction now can help you refine your technique, get over stumbling blocks, and relearn skills that you may have learned incorrectly.

Putting It All Together

Now that you know the basic components of a fitness program, you can put them all together in a program that works for you. Remember to include the following:

- **Cardiorespiratory endurance exercise:** Do at least 150 minutes of moderate-intensity aerobic exercise or 75 minutes of vigorous-intensity exercise per week (or a combination).
- **Muscular strength and endurance:** Work the major muscle groups (one or more sets of 8–10 exercises) at least 2 nonconsecutive days a week.
- **Flexibility exercise:** Do stretches at least 2–3 days a week and ideally 5–7 days a week, preferably after exercise when your muscles are warm.
- **Skill training:** Incorporate some or all of your aerobic or strengthening exercise into an enjoyable sport or physical activity.

See Figure 13.9 for a summary of the FITT principle for the health-related components of fitness.

GETTING STARTED AND STAYING ON TRACK

Once you have a program that fulfills your basic fitness needs and suits your personal tastes, adhering to a few basic principles will help you improve quickly, have fun, and minimize the risk of injury. These principles include buying appropriate equipment, eating and drinking properly, and managing your program so it becomes an integral part of your life.

	Cardiorespiratory Endurance Training	Strength Training	Flexibility Training
F requency	3–5 days per week	2–3 nonconsecutive days per week	2–3 days per week (minimum); 5–7 days per week (ideal)
I ntensity	55/65–90% of maximum heart rate	Sufficient resistance to fatigue muscles	Stretch to the point of tension
T ime	20–60 minutes in sessions lasting 10 minutes or more	8–12 repetitions of each exercise, 1 or more sets	2–4 repetitions of each exercise, held for 15–30 seconds
T ype	Continuous rhythmic activities using large muscle groups	Resistance exercises for all major muscle groups	Stretching exercises for all major joints

FIGURE 13.9 A summary of the FITT principle for the health-related components of fitness.

Selecting Instructors, Equipment, and Facilities

Once you've chosen the activities for your program, you may need to look for the appropriate information, instruction, and equipment or find an appropriate facility.

Finding Help and Advice One of the best places to get help is an exercise class, where an expert instructor can teach you the basics of training and answer your questions. A qualified personal trainer can also get you started on an exercise program or a new form of training. Make sure that your instructor or trainer has proper qualifications, such as a college degree in exercise physiology, kinesiology, or physical education and certification by the American College of Sports Medicine (ACSM), National Strength and Conditioning Association (NSCA), International Sports Science Association (ISSA), or another professional organization. Don't seek out a person for advice simply because he or she looks fit. You can further your knowledge by reading articles by experts in fitness magazines such as *Fitness RX for Men* and *Fitness RX for Women*.

Many websites provide fitness programs, including ongoing support and feedback via e-mail. Many of these sites charge fees, so it is important to review the sites, decide which ones seem most appropriate, and if possible go through a free trial period before subscribing. Also remember to consider the reliability of the information at fitness websites, especially those that also advertise or sell products. A few popular sites are listed in the "For More Information" section at the end of the chapter.

Selecting Equipment Purchase the best equipment you can afford. Good equipment will enhance your enjoyment and decrease your risk of injury. Appropriate safety equipment, such as pads and helmets for skateboarding, is particularly important. If you shop around, you can often find bargains through mail-order companies and discount or used equipment stores.

Before you invest in a new piece of equipment, investigate it. Try it out at a local gym to make sure that you'll use it regularly. Make sure you have space to use and store it at

home. Ask the experts (coaches, physical educators, and sports instructors) for their opinions. Also, educate yourself and become a lifelong student of physical activity and sport.

Footwear is an important piece of equipment for almost any activity; see the box "What to Wear" for shopping strategies.

Choosing a Fitness Center Are you thinking of joining a health club or fitness center? Be sure to choose one that has the right programs and equipment available at the times you will use them. You should feel comfortable with the classes and activities available; the age, fitness level, and dress of others in the club; and the types of music used in classes. The facility and equipment should be clean and well maintained, including the showers and lockers. The staff should be well trained and helpful.

Also make sure the facility is certified. Look for the displayed names American College of Sports Medicine (ACSM), National Strength and Conditioning Association (NSCA), American Council on Exercise (ACE), or Aerobics and Fitness Association of America (AFAA). These trade associations have established standards to help protect consumer health, safety, and rights.

QUICK STATS

Only 16% of the U.S. population belongs to a health club, but membership has increased more than 10% over the past three years to over 50.2 million members.

—IHSA, 2012

Eating and Drinking for Exercise

Most people do not need to change their eating habits when they begin a fitness program. Many athletes and other physically active people are lured into buying aggressively advertised vitamins, minerals, and protein supplements, but in most cases a well-balanced diet contains all the energy and nutrients needed to sustain an exercise program (see Chapter 12).

A balanced diet is also the key to improving body composition when you begin to exercise more. One of the promises of a fitness program is a decrease in body fat and an increase in muscle mass. The control of body fat is determined by energy balance—food energy versus expended energy. If more calories are consumed than are expended through metabolism and exercise, fat increases. If the reverse is true, fat is lost. The best way to control body fat is to follow a reduced-calorie diet and to be physically active.

One of the most important principles to follow when exercising is to drink enough water. Your body depends on water to sustain many chemical reactions and to maintain correct body temperature. Sweating during exercise depletes the body's water supply and can lead to dehydration if fluids are not replaced. Serious dehydration can cause reduced blood volume, accelerated heart rate, elevated body temperature, muscle cramps, heat stroke, and other serious problems.

Drinking fluids before and during exercise is important to prevent dehydration and enhance performance. Thirst receptors in the brain make you want to drink fluids, but during heavy or prolonged exercise or exercise in hot weather, thirst

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think of a few physical activities and sports that you would like to do, but haven't. Given your current fitness and skill level, which ones could you reasonably incorporate into your exercise program?



CRITICAL CONSUMER

What to Wear

Clothing

Sports clothing has come a long way since the old high school gym suit. Modern exercise clothing is attractive, comfortable, and functional. Shorts made of elastic material, such as spandex, hug the body, supplying support. If you prefer, you can wear running shorts and a T-shirt. The main requirement for workout clothes is that they let you move easily but are not so loose that they get caught in the exercise machines or on fences when running outside. Don't wear street clothes when exercising because they can interfere with movement, and sweat, oil, and dirt can ruin them. If you run or cycle on the street, wear bright-colored clothing so motorists can see you.

Breast Support for Women

Wear a good sports bra whenever you exercise. Breast support is important when running, playing volleyball, or weight training. The breasts can be injured if barbells press too firmly against them when you are weight-training or if they aren't properly supported when you run. A good sports bra should support the breasts in all directions, contain little elastic material, absorb moisture freely, and be easily laundered. Seams, hooks, and catches should not irritate the skin. You might consider buying a bra with an underwire for added support and a pocket in which to insert padding if you do exercises that could cause injury.

Footwear

Footwear is perhaps the most important item of equipment for almost any activity. Shoes protect and support your feet and improve your traction. When you jump or run, you place as much as six times more force on your feet than when you stand still. Shoes can help cushion against the stress that this additional force places on your lower legs, thereby preventing injuries. Some athletic shoes are also designed to help prevent ankle rollover, another common source of injury.

When choosing athletic shoes, first consider the activity you've chosen for your exercise program. Shoes appropriate for different activities have different characteristics. Foot type is another important consideration. If your feet tend to roll inward excessively, you may need additional stability features on the inner side of the shoe to counteract this movement. If your feet tend to roll outward excessively, you may need highly flexible and cushioned shoes that promote foot motion. Most women will get a better fit if they choose shoes that are specially designed for women's feet rather than downsized versions of men's shoes.



Successful Shopping

For successful shoe shopping, keep the following strategies in mind:

- Shop late in the day or, ideally, following a workout. Your foot size increases during the day and after exercise.
- Wear socks like those you plan to wear during exercise.
- Try on both shoes and wear them around for 10 minutes or more. Try walking on a noncarpeted surface. Approximate the movements of your activity: walk, jog, run, jump, and so on.
- Check the fit and style carefully:
 - Is the toe box roomy enough? Your toes will spread out when your foot hits the ground or you push off. There should be at least one thumb's width of space from the longest toe to the end of the toe box.
 - Do the shoes have enough cushioning? Do your feet feel supported when you bounce up and down? Try bouncing on your toes and on your heels.
 - Do your heels fit snugly in the shoe? Do they stay put when you walk, or do they slide up?
 - Are the arches of your feet on top of the shoes' arch supports?
 - Do the shoes feel stable when you twist and turn on the balls of your feet? Try twisting from side to side while standing on one foot.
 - Do you feel any pressure points?
- If you exercise at dawn or dusk, choose shoes with reflective sections for added visibility and safety.
- Replace athletic shoes about every three months or 300–500 miles of jogging or walking.

alone isn't a good indication of how much fluid you need to drink. As a rule of thumb, drink at least 16 ounces of fluid two hours before exercise and then drink enough during exercise to prevent significant fluid loss in sweat. After exercise, let thirst be your guide to your fluid needs.

Bring a bottle of water when you exercise so you can replace your fluids when they're depleted. For exercise sessions lasting less than 60–90 minutes, cool water is an excellent fluid replacement. For longer workouts, a sports drink that contains water and small amounts of electrolytes

(sodium, potassium, and magnesium) and simple carbohydrates (sugar, usually in the form of sucrose or glucose) is recommended.

Managing Your Fitness Program

How can you tell when you're in shape? When do you stop improving and start maintaining? How can you stay motivated? If your program is going to become an integral part of your life, and if the principles behind it are going to serve you well in the future, these are key questions.

Start Slowly, Get in Shape Gradually As Figure 13.10 shows, an exercise program can be divided into three phases:

- **Beginning phase.** The body adjusts to the new type and level of activity.
- **Progress phase.** Fitness increases.
- **Maintenance phase.** The targeted level of fitness is sustained over the long term.

When beginning a program, start slowly to give your body time to adapt to the stress of exercise. Choose activities carefully according to your fitness status.

Exercising Consistently Consistency is the key to getting into shape without injury. Steady fitness improvement

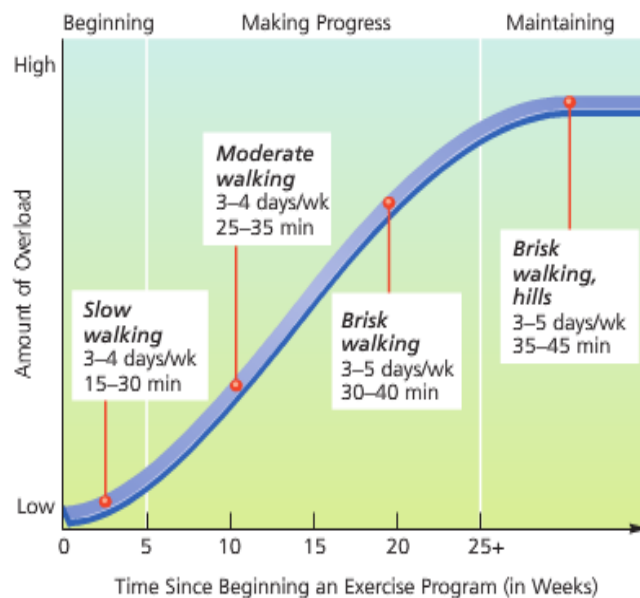


FIGURE 13.10 Progression of an exercise program.

This figure shows how the amount of overload is increased gradually over time in a sample walking program. Regardless of the activity chosen, it is important that an exercise program begin slowly and progress gradually. Once you achieve the desired level of fitness, you can maintain it by exercising 3–5 days a week.

SOURCE: Progression data from American College of Sports Medicine. 2009. *ACSM's Guidelines for Exercise Testing and Prescription*, 8th ed. Philadelphia: Lippincott Williams & Wilkins.

comes when you overload your body consistently over time. The best way to ensure consistency is to record the details of your workouts in a journal: how far you ran, how much weight you lifted, and so on. This record will help you evaluate your progress and plan workout sessions intelligently. Don't increase your exercise volume by more than 5–10% per week.

Assessing Your Fitness When are you in shape? It depends. One person may be out of shape running a mile in 5 minutes, but another may be in shape running a mile in 12 minutes. As mentioned earlier, your ultimate level of fitness depends on your goals, your program, and your natural ability. The important thing is to set goals that make sense for you.

If you are interested in finding out exactly how fit you are before starting a program, the best approach is to get an assessment from a sports medicine laboratory. Such labs can be found in medical centers and university kinesiology or physical education departments. Here you will receive an accurate profile of your capacity to exercise. Typically your endurance will be measured on a treadmill or bicycle, your body fat will be estimated, and your strength and flexibility will be tested. This evaluation will reveal whether your physical condition is consistent with good health, and the lab's staff members can suggest an exercise program that will be appropriate for your fitness level. To assess your own approximate level of cardiorespiratory endurance, take the test in the box "The 1.5-Mile Run-Walk Test."

Preventing and Managing Athletic Injuries Although they are annoying, most injuries are neither serious nor permanent. If an injury is not cared for properly, however, it can escalate into a chronic problem. If you learn how to deal with injuries, they won't derail your fitness program (Table 13.3).

Some injuries require medical attention. See a physician right away if you suffer a head or eye injury, a possible ligament injury, a broken bone, or an internal disorder such as chest pain, fainting, or intolerance to heat. Also seek medical attention for apparently minor injuries that do not get better within a reasonable amount of time.

For minor cuts and scrapes, stop the bleeding and clean the wound with soap and water. Treat soft tissue injuries (muscles and joints) with the R-I-C-E principle:

Rest: Stop using the injured tissue as soon as you experience pain, protect it from further injury, and avoid any activity that causes pain.

Ice: Apply ice to the injured tissue to reduce swelling and alleviate pain. Apply ice immediately for 10–20 minutes, and repeat every few hours until the swelling disappears. Let the injured part return to normal temperature between icings, and do not apply ice to one area for more than 20 minutes (10 minutes if you are using a cold gel pack).



ASSESS YOURSELF

The 1.5-Mile Run–Walk Test

You can obtain a general rating of your cardiorespiratory fitness by taking the 1.5-mile run–walk test. Don't attempt this test unless you have completed at least six weeks of some type of conditioning activity. Also, if you are over age 35 or have questions about your health, check with your physician before taking this test.

You'll need a stopwatch, clock, or watch with a second hand and a running track or course that is flat and provides measurements of up to 1.5 miles. You may want to practice pacing yourself before taking the test to avoid going too fast at the start and becoming fatigued before you finish. Allow yourself a day or two to recover from a practice run before taking the test.

Warm up before taking the test with some walking, easy jogging, and stretching exercises. The idea is to cover the distance as fast as possible at a pace that is comfortable for you. You can run or walk the entire distance or use some combination of running and walking. If possible, monitor your own pace, or have someone call out your time at various intervals to help you determine whether your pace is correct.

When you have completed the test, refer to the table for your cardiorespiratory fitness rating. Be sure to cool down by walking or jogging slowly for about 5 minutes.

Standards for the 1.5-Mile Run–Walk Test (Minutes:Seconds)

	Superior	Excellent	Good	Fair	Poor	Very Poor
Women						
Age: 18–29	11:00 or less	11:15–12:45	13:00–14:15	14:30–15:45	16:00–17:30	17:45 or more
30–39	11:45 or less	12:00–13:30	13:45–15:15	15:30–16:30	16:45–18:45	19:00 or more
40–49	12:45 or less	13:00–14:30	14:45–16:30	16:45–18:30	18:45–20:45	21:00 or more
50–59	14:15 or less	14:30–16:30	16:45–18:30	18:45–20:30	20:45–23:00	23:15 or more
60 and over	14:00 or less	14:15–17:15	17:30–20:15	20:30–22:45	23:00–24:45	25:00 or more
Men						
Age: 18–29	9:15 or less	9:30–10:30	10:45–11:45	12:00–12:45	13:00–14:00	14:15 or more
30–39	9:45 or less	10:00–11:00	11:15–12:15	12:30–13:30	13:45–14:45	15:00 or more
40–49	10:00 or less	10:15–11:45	12:00–13:00	13:15–14:15	14:30–16:00	16:15 or more
50–59	10:45 or less	11:00–12:45	13:00–14:15	14:30–15:45	16:00–17:45	18:00 or more
60 and over	11:15 or less	11:30–13:45	14:00–15:45	16:00–17:45	18:00–20:45	21:00 or more

SOURCES: From *The Aerobics Program for Total Well Being* by Kenneth H. Cooper M.D., M.P.H., copyright © 1982 by Kenneth H. Cooper. Used by permission of Bantam Books, a division of Random House, Inc., and from The Cooper Aerobics Institute, Dallas, Texas. Available online at www.cooperaerobics.com.

Compression: Wrap the injured area with an elastic or compression bandage between icings. If the area starts throbbing or begins to change color, the bandage may be wrapped too tightly. Do not sleep with the bandage on.

Elevation: Raise the injured area above heart level to decrease the blood supply and reduce swelling.

After 36–48 hours, if the swelling has disappeared, apply heat to relieve pain, relax muscles, and reduce stiffness. Immerse the affected area in warm water or apply warm compresses, a hot water bottle, or a heating pad.

After a minor athletic injury, gradually reintroduce the stress of the activity until you can return to full intensity. Before returning to full exercise participation, you should have a full range of motion in your joints; normal strength and balance; no injury compensation movements, such as limping; and little or no pain.

To prevent injuries, follow a few basic guidelines:

- Stay in condition: haphazard exercise programs invite injury.
- Warm up thoroughly before exercising.
- Use proper body mechanics when lifting objects or executing sports skills.
- Don't exercise when you're ill or overtrained (experiencing extreme fatigue due to overexercising).
- Use the proper equipment.
- Don't return to your normal exercise program until athletic injuries have healed.

You can minimize the risk of injury by following safety guidelines, respecting signals from your body that something may be wrong, and treating injuries promptly.

Use special caution in heat or humidity (over 80°F and/or 60% humidity): Exercise slowly, rest frequently in the shade,

Table 13.3

Care of Common Exercise Injuries and Discomforts

INJURY	SYMPTOMS	TREATMENT
Blister	Accumulation of fluid in one spot under the skin	Don't pop or drain it unless it interferes too much with your daily activities. If it does pop, clean the area with antiseptic and cover with a bandage. Do not remove the skin covering the blister.
Bruise (contusion)	Pain, swelling, and discoloration	R-I-C-E: rest, ice, compression, elevation.
Fracture and/or dislocation	Pain, swelling, tenderness, loss of function, and deformity	Seek medical attention, immobilize the affected area, and apply cold.
Joint sprain	Pain, tenderness, swelling, discoloration, and loss of function	R-I-C-E. Apply heat when swelling has disappeared. Stretch and strengthen affected area.
Muscle cramp	Painful, spasmodic muscle contractions	Gently stretch for 15–30 seconds at a time and/or massage the cramped area. Drink fluids and increase dietary salt intake if exercising in hot weather.
Muscle soreness or stiffness	Pain and tenderness in the affected muscle	Stretch the affected muscle gently; exercise at a low intensity; apply heat. Nonsteroidal anti-inflammatory drugs, such as ibuprofen, help some people.
Muscle strain	Pain, tenderness, swelling, and loss of strength in the affected muscle	R-I-C-E. Apply heat when swelling has disappeared. Stretch and strengthen the affected area.
Plantar fasciitis	Pain and tenderness in the connective tissue on the bottom of your feet	Apply ice, take nonsteroidal anti-inflammatory drugs, and stretch. Wear night splints when sleeping.
Shin splint	Pain and tenderness on the front of the lower leg; sometimes also pain in the calf muscle	Rest. Apply ice to the affected area several times a day and before exercise; wrap with tape for support. Stretch and strengthen muscles in the lower legs. Purchase good-quality footwear and run on soft surfaces.
Side stitch	Pain on the side of the abdomen	Stretch the arm on the affected side as high as possible; if that doesn't help, try bending forward while tightening the abdominal muscles.
Tendinitis	Pain, swelling, and tenderness of the affected area	R-I-C-E. Apply heat when swelling has disappeared. Stretch and strengthen the affected area.

SOURCE: Fahey, T. D., P. M. Insel, and W. T. Roth. 2013. *Fit and Well: Core Concepts and Labs in Physical Fitness and Wellness*, 10th ed. New York: McGraw-Hill. Copyright © 2013 The McGraw-Hill Companies, Inc.

wear clothing that breathes, and drink plenty of fluids. Slow down or stop if you begin to feel uncomfortable. During hot weather, exercise in the early morning or evening when temperatures are lowest.

Staying with Your Program Once you have attained your desired level of fitness, you can maintain it by exercising regularly at a consistent intensity, 3–5 days a week. You must work at the intensity that brought you to your desired fitness level. If you don't, your body will become less fit because less is expected of it. In general, if you exercise at the same intensity over a long period, your fitness will level out and can be maintained easily.

Adapt your program to changes in environment or schedule. Don't use wet weather or a new job as an excuse to give up your fitness program. If you walk in the summer, dress appropriately and walk in the winter as well. (Exercise is usually safe even in very cold temperatures as long as you dress warmly in layers and don't stay out too long.) If you can't go out because of darkness or an unsafe neighborhood, walk in a local shopping mall or on campus or join a gym and walk on a treadmill.

What if you run out of steam? Although good health is an important *reason* to exercise, it's a poor *motivator*. You'll find specific suggestions for staying with your program in the box "Maintaining Your Exercise Program" and in the "Behavior Change Strategy" section at the end of the chapter.

Varying your program is another key strategy. Some people alternate two or more activities—swimming and jogging, for example—to improve a particular component of fitness. The practice, called **cross-training**, can help prevent boredom and overuse injuries. Explore many exercise options. Consider competitive sports at the recreational level, or find out how you can participate in an activity you've never done before. Try new activities, especially ones that you will be able to do for the rest of your life.

cross-training Participating in two or more activities to develop a variety of fitness components.

TERMS



TAKE CHARGE

Maintaining Your Exercise Program

- *Set realistic goals.* Unrealistically high goals will discourage you.
- *Sign a contract and keep a fitness journal.* A journal can help keep your program on track, identify problems, and give you a continuing sense of accomplishment.
- *Start slowly and increase your intensity and duration gradually.* Overzealous exercising can result in discouraging discomfort and injuries. Your program is meant to last a lifetime. The important first step is to break your established pattern of inactivity.
- *Make your program fun.* Participate in a variety of different activities that you enjoy. Vary the routes you take when walking, running, or biking.
- *Exercise with a friend.* The social side of exercise is important to many people.
- *Focus on the positive.* Concentrate on the improvements you get from your program, and how good you feel during and after exercise.
- *Revisit and revise.* If your program turns out to be unrealistic, revise it. Expect to make many adjustments in your program along the way.
- *Expect fluctuation.* On some days your progress will be excellent, but on others you'll barely be able to drag yourself through your scheduled activities.
- *Expect lapses.* Don't let lapses discourage you or make you feel guilty. Instead make a renewed commitment to your exercise program.
- *Plan ahead for difficult situations.* Think about what circumstances might make it tough to keep up with your fitness routine, and develop strategies for sticking with your program. For example, devise a plan for your program during vacation, travel, bad weather, and so on.
- *Reward yourself.* Give yourself frequent rewards for sticking with your program.
- *Renew your attitude.* If you notice you're slacking off, try to list the negative thoughts and behaviors that are causing you to lose interest. Devise a strategy to reduce negative thoughts and behaviors. Make changes in your program plan and reward system to help renew your enthusiasm and commitment.
- *Review your goals.* Visualize what it will be like to reach them, and keep these pictures in your mind as an incentive to stick to your program.

connect[™]
ACTIVITY
DO IT ONLINE

Connect to Your Choices

Have you ever thought about how you came to have the physical activity patterns you have? Many factors can influence our physical activity and exercise choices, some not as obvious as others. Was your family physically active when you were growing up? Do you have access to a fitness center or facilities and equipment for working out? Do you hang out with people who make physical activity part of their daily lives—or with couch potatoes?

What are the external factors that influence your choices about exercise? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

Physical activity and exercise offer benefits in nearly every area of wellness. Even a low to moderate level of activity provides valuable health benefits.

RIGHT NOW YOU CAN:

- Go outside and take a brisk 15-minute walk.
- Look at your calendar for the rest of the week and write in some physical activity—such as walking, running, or playing Frisbee—on as many days as you can. Schedule the activity for a specific time and stick to it.
- Call a friend and invite him or her to start planning a regular exercise program with you.

IN THE FUTURE YOU CAN:

- Schedule a session with a qualified personal trainer who can evaluate your current fitness level and help you set personalized fitness goals.
- Create seasonal workout programs for the summer, spring, fall, and winter. Develop programs that are varied but consistent with your overall fitness goals.

SUMMARY

- The five components of physical fitness most important to health are cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition.
- Exercise improves the functioning of the heart and the ability of the cardiorespiratory system to carry oxygen to the body's tissues. It also increases metabolic efficiency and improves body composition.
- Exercise lowers the risk of cardiovascular disease by improving blood fat levels, reducing high blood pressure, and interfering with the disease process that causes coronary artery blockage.
- Exercise reduces the risk of cancer, osteoporosis, and diabetes. It improves immune function and psychological health and helps prevent injuries and low-back pain.
- Most people should accumulate at least 150 minutes per week of moderate-intensity or 75 minutes of vigorous-intensity physical activity. Longer-duration or more vigorous activity produces additional health and fitness benefits.
- Cardiorespiratory endurance exercises stress a large portion of the body's muscle mass. Endurance exercise should be performed 3–5 days per week for a total of 20–60 minutes per day. Intensity can be evaluated by measuring the heart rate.
- Warming up before exercising and cooling down afterward improve your performance and decrease your chances of injury.
- Exercises that develop muscular strength and endurance involve exerting force against a significant resistance. A strength training program for general fitness typically involves one or more sets of 8–12 repetitions of 8–10 exercises performed on at least 2 non-consecutive days per week.
- A good stretching program includes exercises for all the major muscle groups and joints of the body. Do a series of active, static stretches at least 2–3 days per week. Hold each stretch for 15–30 seconds and do 2–4 repetitions. Stretch when muscles are warm.
- Instructors, equipment, and facilities should be chosen carefully to enhance enjoyment and prevent injuries.
- A well-balanced diet contains all the energy and nutrients needed to sustain a fitness program. When exercising, remember to drink enough fluids.
- Rest, ice, compression, and elevation (R-I-C-E) are treatments for minor muscle and joint injuries.
- A desired level of fitness can be maintained by exercising 3–5 days a week at a consistent intensity.
- Strategies for maintaining an exercise program over the long term include having meaningful goals, varying the program, and trying new activities.

FOR MORE INFORMATION

BOOKS

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- Richmond, M. 2011. *The Physiology Storybook: An Owner's Manual for the Human Body*. Monterey, CA: Healthy Learning. A discussion of human physiology and wellness written for the average person.
- Rothman, J., and T. LaFontaine. 2011. *The Exercise Professional's Guide to Optimizing Health: Strategies for Preventing and Reducing Chronic Disease*. Baltimore: Lippincott Williams & Wilkins. Written for professionals in association with the American College of Sports Medicine, the book describes how exercise can help prevent and treat chronic disease.
- Woods, R., and C. Jordon. 2010. *Energy Every Day*. Champaign, IL: Human Kinetics. A sensible guide to fitness and nutrition that will help you attain your fitness goals.

ORGANIZATIONS, HOTLINES, AND WEBSITES

- American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD). A professional organization dedicated to promoting quality health and physical education programs.
<http://www.aahperd.org>
- American College of Sports Medicine (ACSM). The principal professional organization for sports medicine and exercise science. Provides brochures, publications, and audio- and videotapes.
<http://www.acsm.org>
- American Council on Exercise (ACE). Promotes exercise and fitness; the website features fact sheets on many consumer topics, including choosing shoes, cross-training, and steroids.
<http://www.acefitness.org>
- American Heart Association: Start! Walking for a Healthier Lifestyle. Provides practical advice for people of all fitness levels plus an online fitness diary.
http://www.startwalkingnow.org/about_start.jsp
- CDC Physical Activity Information. Provides information about the benefits of physical activity and suggestions for incorporating moderate physical activity into daily life.
<http://www.cdc.gov/physicalactivity/>
- Disabled Sports USA. Provides sports and recreation services to people with physical or mobility disorders.
<http://www.dsusa.org>

BEHAVIOR CHANGE STRATEGY

Planning a Personal Exercise Program

Although most people recognize the importance of incorporating exercise into their lives, many find it difficult to do. No single strategy will work for everyone, but the general steps outlined here should help you create an exercise program that fits your goals, preferences, and lifestyle. A carefully designed contract and program plan can help you convert your vague wishes into a detailed plan of action. And the strategies for program compliance outlined here and in Chapter 1 can help you enjoy and stick with your program for the rest of your life.

Step 1: Set Goals

Setting specific goals to accomplish by exercising is an important first step in a successful fitness program because it establishes the direction you want to take. Your goals might be specifically related to health, such as lowering your blood pressure and risk of heart disease, or they might relate to other aspects of your life, such as improving your tennis game or the fit of your clothes. If you can decide why you're starting to exercise, it can help you keep going.

Think carefully about your reasons for incorporating exercise into your life, and then fill in the goals portion of the Personal Fitness Contract.

Step 2: Select Activities

As discussed in the chapter, the success of your fitness program depends on the consistency of your involvement. Select activities that encourage your commitment: the right program will be its own incentive to continue, but poor activity

choices provide obstacles and can turn exercise into a chore.

When choosing activities for your fitness program, consider the following:

- Is this activity fun? Will it hold my interest over time?
- Will this activity help me reach the goals I have set?
- Will my current fitness and skill level enable me to participate fully in this activity?
- Can I easily fit this activity into my daily schedule? Are there any special requirements (facilities, partners, equipment, etc.) that I must plan for?
- Can I afford any special costs required for equipment or facilities?
- If I have special exercise needs due to a particular health problem, does this activity conform to those exercise needs? Will it enhance my ability to cope with my specific health problem?

Using these guidelines listed, select a number of sports and activities. Fill in the Program Plan portion of the Fitness Contract, including the fitness components your choices will develop and the frequency, intensity, and time standard you intend to meet for each activity. Does your program meet the criteria of a complete fitness program discussed in the chapter?

Step 3: Make a Commitment

Complete your Fitness Contract and Program Plan by signing your contract and having it witnessed by someone who can help make you accountable for your prog-

ress. By completing a contract, you make a firm commitment and will be more likely to follow through until you meet your goals.

Step 4: Begin and Maintain Your Program

Start slowly to allow your body time to adjust. Be realistic and patient—meeting your goals will take time. The following guidelines may help you start and stick with your program:

- Set aside regular periods for exercise. Choose times that fit in best with your schedule, and stick to them. Allow an adequate amount of time for warm-up, cool-down, and a shower.
- Take advantage of any opportunity for exercise that presents itself (for example, walk to class or take stairs instead of an elevator).
- Do what you can to avoid boredom. Do stretching exercises or jumping jacks to music, or watch the evening news while riding your stationary bicycle.
- Exercise with a group that shares your goals and general level of competence.
- Vary the program. Change your activities periodically. Alter your route or distance if biking or jogging. Change racquetball partners, or find a new volleyball court.
- Establish minigoals or a point system, and work rewards into your program. Until you reach your main goals, a series of small rewards will help you stick with your program. Rewards should be things you enjoy that are easily obtainable.

International Health, Racquet, and Sportsclub Association (IHRSA): Health Clubs. Provides guidelines for choosing a health or fitness facility and links to clubs that belong to IHRSA.

<http://www.healthclubs.com>

International Sports Sciences Association (ISSA). Trains and certifies personal trainers.

www.issaonline.com

MedlinePlus: Exercise and Physical Fitness. Provides links to news and reliable information about fitness and exercise from government agencies and professional associations.

<http://www.nlm.nih.gov/medlineplus/exerciseandphysicalfitness.html>

President's Council on Physical Fitness and Sports (PCPFS). Provides information about PCPFS programs and publications, including fitness guides and fact sheets.

<http://www.fitness.gov>

<http://www.presidentschallenge.org>

Shape Up America! A nonprofit organization that provides information and resources for exercise, nutrition, and weight loss.

<http://www.shapeup.org>

The following provide links to sites with information about a wide variety of activities and fitness issues; evaluate commercial sites carefully.

Dragondoor (information on kettlebells): <http://www.dragondoor.com>

Personal Fitness Contract

I, _____, am contracting with myself to follow an exercise program to work at the following goals. I will begin my program on _____.

Fitness Goals

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Program Plan

Activities	Components (Check ✓)					Frequency (Check ✓)							Intensity	Time
	CRE	MS	ME	F	BC	M	Tu	W	Th	F	Sa	Su		
1. _____														
2. _____														
3. _____														
4. _____														
5. _____														

Note: You should conduct activities for achieving CRE goals at your target heart rate.

I agree to maintain a record of my activity, assess my progress periodically, and, if necessary, revise my goals.

Signed _____ Date _____

Witness _____

Step 5: Record and Assess Your Progress

Keeping a record that notes the daily results of your program will help remind you of your ongoing commitment to your program and give you a sense of accomplish-

ment. Create daily and weekly program logs that you can use to track your progress. Record the activity frequency, intensity, time, and type. Keep your log handy, and fill it in immediately after each exercise session. Post it in a visible place to re-

mind you of your activity schedule and to provide incentive for improvement.

SOURCE: Adapted from Kusnitz, I. and M. Fine. 1995. *Your Guide to Getting Fit*, 3rd ed. Mountain View, CA: Mayfield.

Fitness Jumpsite: <http://www.primusweb.com/fitnesspartner>

NetSweat: The Internet's Fitness Resource : <http://www.netsweat.com>

Yahoo!Fitness: <http://dir.yahoo.com/Health/Fitness>

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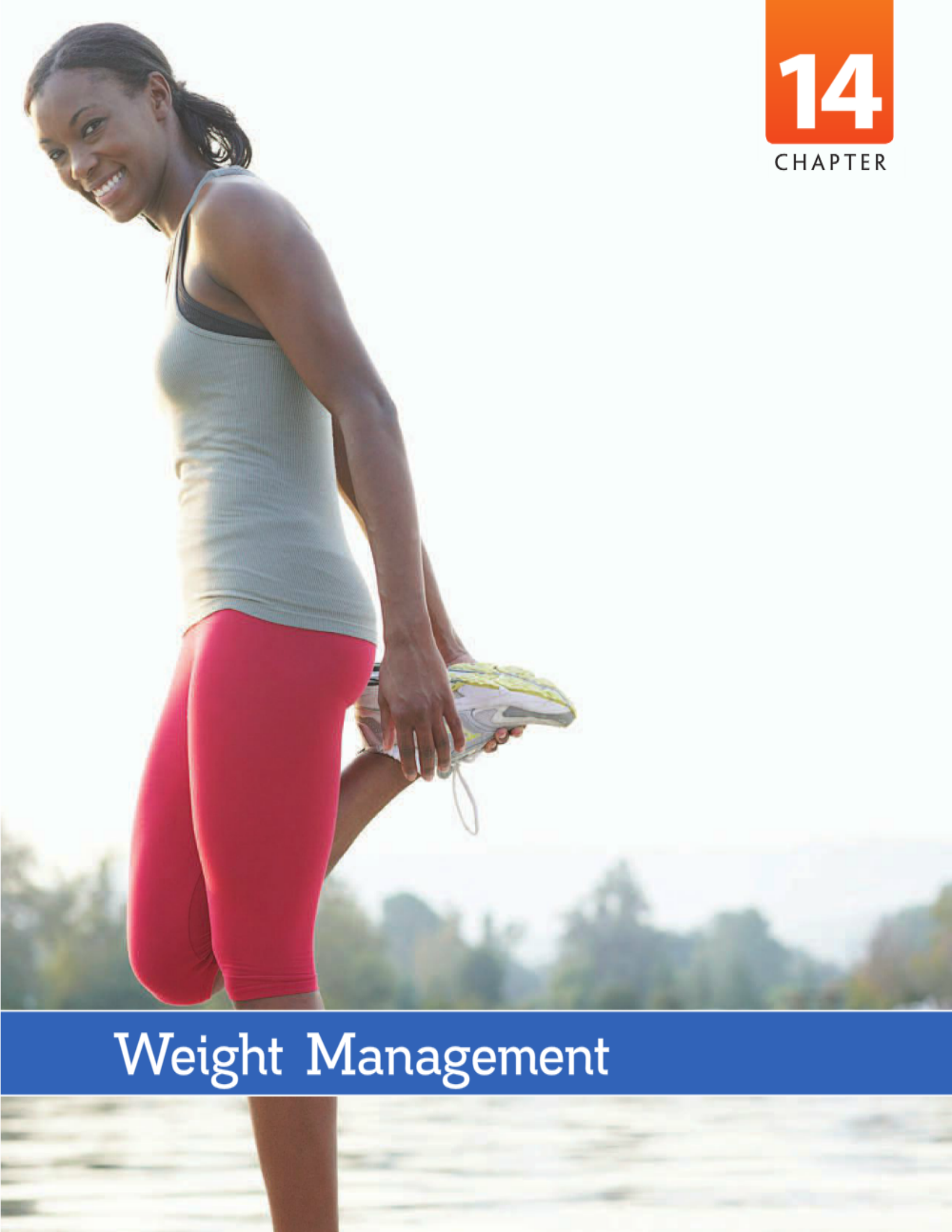
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A smiling woman with dark hair, wearing a light green tank top and bright pink leggings, is stretching her right leg by pulling her foot towards her back. She is wearing white and yellow sneakers. The background is a bright, hazy outdoor setting with trees and a body of water.

Weight Management

LOOKING AHEAD...

After reading this chapter, you should be able to

- Discuss different methods for assessing body weight and body composition
- Explain the health risks associated with overweight and obesity
- Explain factors that may contribute to a weight problem, including genetic, physiological, lifestyle, and psychosocial factors
- Describe lifestyle factors that contribute to weight gain and loss, including the roles of diet, exercise, and emotions
- Identify and describe the symptoms of eating disorders and the health risks associated with them
- Design a personal plan for successfully managing body weight

TEST YOUR KNOWLEDGE

1. About what percentage of American adults are overweight?
 - a. 15%
 - b. 35%
 - c. 69%
2. Genetic factors explain most cases of obesity. True or false?
3. The consumption of low-calorie sweeteners has helped Americans control their weight. True or false?
4. Approximately how many female high school and college students have either anorexia or bulimia?
 - a. 0%
 - b. 1%
 - c. 2%
5. Which of the following is the most significant risk factor for type 2 diabetes (the most common type of diabetes)?
 - a. Smoking
 - b. Low-fiber diet
 - c. Overweight or obesity

ANSWERS

1. **C.** About 69% of American adults are overweight, including 35.7% who are obese.
2. **FALSE.** Genetic factors may increase an individual's tendency to gain weight, but lifestyle is the key contributing factor.
3. **FALSE.** Ever since the introduction of low-calorie sweeteners, both total calorie and sugar intake have increased, as has the proportion of Americans who are overweight.
4. **C.** About 2–4% of female students suffer from bulimia or anorexia, and many more occasionally engage in behaviors associated with these eating disorders.
5. **C.** All are risk factors for diabetes, but overweight or obesity is the most significant. It's estimated that 90% of cases of type 2 diabetes could be prevented if people adopted healthy lifestyle behaviors.

Achieving and maintaining a healthy body weight is a public health priority and a serious challenge for many Americans. By the standards developed by the National Institutes of Health (NIH), 68.8% of American adults are overweight, including 35.7% who are obese (Table 14.1 and Figure 14.1). Of adult men, an estimated 35.5% are obese, and of adult women, an estimated 35.8%. One study predicted that at current rates, 42% of Americans will be obese by 2050. And while millions struggle to lose weight, others fall into dangerous eating patterns such as binge eating or self-starvation.

Although not completely understood, managing body weight is not a mysterious process. It's basically a matter of balancing the calories you take in with calories you expend in daily activities—in other words, eating a moderate diet and being physically active. Unfortunately this reality is not as exciting as fad diets or “scientific breakthroughs” that promise rapid weight loss without effort. Many people fail in their efforts at weight management because they focus on short-term weight loss rather than permanent changes in lifestyle. To manage your weight successfully, you must coordinate many aspects of your life—including nutrition, physical activity, and stress control—over the long term.

Table 14.1**Weight of Americans Aged 20 and Older, 2009–2010**

GROUP	PERCENT OVERWEIGHT*	PERCENT OBESE
Both sexes	68.8	35.7
All races, male	74.1	35.5
All races, female	64.5	35.8
White, male	74.0	36.2
White, female	59.5	32.2
African American, male	69.9	38.8
African American, female	82.1	58.5
Latino, male	81.7	37.0
Latino, female	75.7	41.4

*Includes obesity

SOURCE: Flegal, K. M., et al. 2012. Prevalence of Obesity and Trends in the Distribution of Body Mass Index among U.S. Adults, 1999–2010. *Journal of the American Medical Association* 307(5): published online January 17.

This chapter explores the factors that contribute to the development of overweight and to eating disorders. It also takes a closer look at weight management through lifestyle behaviors and suggests specific strategies for reaching and maintaining a healthy weight.

BASIC CONCEPTS OF WEIGHT MANAGEMENT

If you are like most people, you are concerned about your weight. But how do you decide if you are overweight? At what point does being overweight present a health risk? And how thin is too thin?

What Is Body Composition, and Why Is It Important?

The human body can be divided into fat-free mass and body fat. Fat-free mass is composed of all the body's nonfat tissues: bone, water, muscle, connective tissue, organ tissues, and teeth.

A certain amount of body fat is necessary for the body to function. Fat is incorporated into the nerves, brain, heart, lungs, liver, mammary glands, and other body organs and tissues. It is the main source of stored energy in the body; it also cushions body organs and helps regulate body temperature. This **essential fat** makes up about 3–5% of total body weight in men and about 8–12% in women. The percentage is higher in women due to fat deposits in the breasts, uterus, and other sex-specific sites.

Most of the fat in the body is stored in fat cells, or **adipose tissue**, located under the skin (**subcutaneous fat**) and around major organs (**visceral** or **intra-abdominal fat**). People have a genetically determined number of fat cells, but these cells can increase or decrease in size depending on how much fat is being

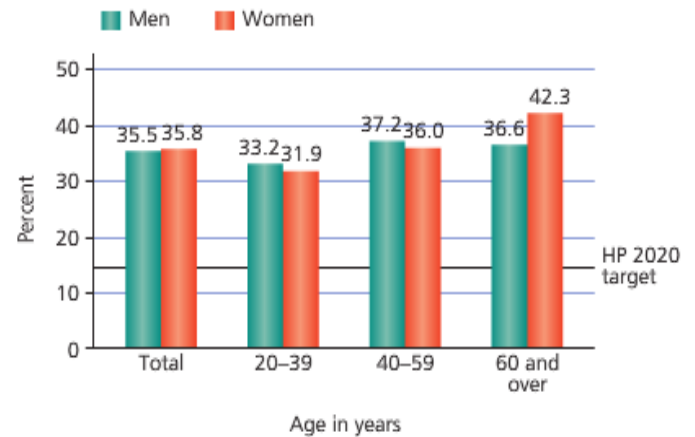


FIGURE 14.1 Prevalence of obesity in American adults, by sex and age, 2009–2010. *Healthy People 2020* sets a target obesity prevalence of 15% for all adults.

stored. The amount of stored fat depends on several factors, including age, sex, metabolism, diet, and activity level. The primary source of excess body fat is excess calories consumed in the diet—that is, calories consumed in excess of calories expended in metabolism, physical activity, and exercise.

A pound of body fat is equal to 3500 calories. If you take in 100 calories per day in excess of the calories you expend, you will gain 10 pounds in a year. Excess stored body fat is associated with increased risk of chronic diseases like arthritis, diabetes, and cardiovascular disease.

Overweight and Obesity Defined

Commonly used methods of assessing and classifying body composition are described later in this chapter. Some methods are based on body weight and others on body fat. Methods based on body weight are less accurate than those based on body fat, but they are commonly used because body weight is easier to measure than body fat.

In the past, many people relied on height/weight tables (which were based on insurance company mortality statistics) to determine whether they were at a healthy weight. Such tables can be very inaccurate for some people. Because muscle tissue is denser and heavier than fat, a fit person can easily weigh more than the recommended weight on a height/weight table, and an unfit person may weigh less.

When looking at body composition, the most important consideration is the proportion of the body's total weight that

essential fat Fat incorporated in various tissues of the body; critical for normal body functioning.

adipose tissue Connective tissue in which fat is stored.

subcutaneous fat Fat located under the skin.

visceral fat Fat located around major organs; also called *intra-abdominal fat*.

TERMS

is fat—the **percent body fat**. For example, two women may both be 5 feet, 5 inches tall and weigh 130 pounds. But one woman may have only 15% of her body weight as fat, whereas the other woman could have 34% body fat. Although neither woman is overweight by most standards, the second woman is overfat. Too much body fat can have a negative effect on health and well-being. Just as the amount of body fat is important, so is its distribution in your body. Visceral fat is more harmful to health than subcutaneous fat.

Overweight is usually defined as total body weight above the recommended range for good health, as determined by large-scale population surveys. **Obesity** is defined as a more serious degree of overweight that carries multiple health risks. Both terms are used to identify weight ranges that are associated with increased likelihood of certain diseases and health problems. Cutoff points for defining overweight and obesity vary with the method used to measure and evaluate body weight and percent body fat.

Energy Balance

The key to achieving and maintaining a healthy body weight and keeping a healthy ratio of fat to fat-free mass across the lifespan is energy balance (Figure 14.2). You take in energy (calories) from the food you eat. Your body uses energy (calories) to maintain vital body functions (resting metabolism), to digest food, and to fuel physical activity. When energy in equals energy out, you maintain your current weight. To change your weight and body composition, you must tip the energy balance equation in a particular direction. If you take

in more calories daily than your body burns (a *positive* energy balance), the excess calories will be stored as fat and you will gain weight over time. If you eat fewer calories than you burn each day (a *negative* energy balance), you will lose some of the stored fat and probably lose weight.

QUICK STATS

In 1970, 15% of adult Americans were obese. In 2010, more than 35% were obese.

—National Center for Health Statistics

If we look at the energy balance equation today as expressed for the general American population, the equation is tipped heavily toward the energy-in side. The 2010 Dietary Guidelines for Americans attribute this calorie imbalance in part to the obesogenic environment in which many Americans currently live. Our environment is rich in large portion sizes; high-fat, high-calorie foods; and palatable, easily available, and inexpensive foods. Unfortunately the energy-out side of the equation has not compensated for increased energy intake; instead we've

decreased work-related physical activity, decreased activity associated with daily living, and increased time spent in sedentary pastimes like TV watching and computer use.

The good news, however, is that you control both parts of the energy balance equation. Specific strategies for altering energy balance are discussed later in the chapter.

Evaluating Body Weight and Body Composition

Several methods can be used to measure and evaluate body weight and percent body fat, some of them simple and inexpensive. These assessments can give you information about the health risks associated with your current body weight and body composition. They can also help you establish reasonable goals and set a starting point for current and future decisions about weight loss and weight gain.

Body Mass Index **Body mass index (BMI)** is a measure of body weight that is useful for estimating a person's weight status and for classifying the health risks of body weight if more sophisticated methods aren't available. BMI is based on the concept that weight should be proportional to height. Easy to calculate and rate, BMI is a fairly accurate measure of

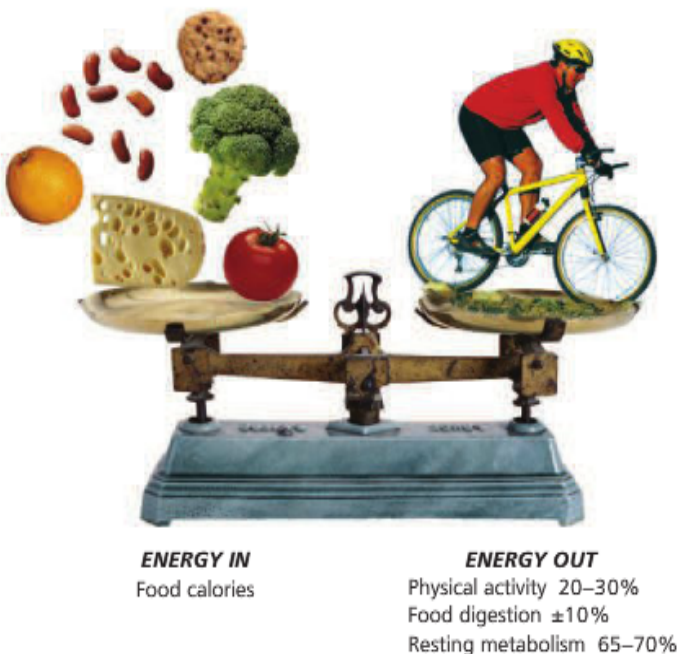


FIGURE 14.2 The energy balance equation.

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percent body fat The percentage of total body weight that is composed of fat.

overweight Body weight above the recommended range for good health.

obesity Severe overweight, characterized by an excessive accumulation of body fat; may also be defined in terms of some measure of total body weight.

body mass index (BMI) A measure of relative body weight that takes height into account and is highly correlated with more direct measures of body fat; calculated by dividing total body weight (in kilograms) by the square of height (in meters).

	<18.5		18.5–24.9						25–29.9					30–34.9					35–39.9					>40
	Underweight		Normal						Overweight					Obesity (Class I)					Obesity (Class II)					Extreme obesity
BMI	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Height									Body Weight (pounds)															
4' 10"	81	86	91	96	101	105	110	115	120	124	129	134	139	144	148	153	158	163	168	172	177	182	187	192
4' 11"	84	89	94	99	104	109	114	119	124	129	134	139	144	149	154	159	163	168	173	178	183	188	193	198
5'	87	92	97	102	108	113	118	123	128	133	138	143	149	154	159	164	169	174	179	184	190	195	200	205
5' 1"	90	95	101	106	111	117	122	127	132	138	143	148	154	159	164	169	175	180	185	191	196	201	207	212
5' 2"	93	98	104	109	115	120	126	131	137	142	148	153	159	164	170	175	181	186	191	197	202	208	213	219
5' 3"	96	102	107	113	119	124	130	136	141	147	153	158	164	169	175	181	186	192	198	203	209	215	220	226
5' 4"	99	105	111	117	122	128	134	140	146	152	157	163	169	175	181	187	192	198	204	210	216	222	227	233
5' 5"	102	108	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	229	235	241
5' 6"	105	112	118	124	130	136	143	149	155	161	167	174	180	186	192	198	205	211	217	223	229	236	242	248
5' 7"	109	115	121	128	134	141	147	153	160	166	173	179	185	192	198	204	211	217	224	230	236	243	249	256
5' 8"	112	118	125	132	138	145	151	158	165	171	178	184	191	197	204	211	217	224	230	237	244	250	257	263
5' 9"	115	122	129	136	142	149	156	163	169	176	183	190	197	203	210	217	224	230	237	244	251	258	264	271
5' 10"	119	126	133	139	146	153	160	167	174	181	188	195	202	209	216	223	230	237	244	251	258	265	272	279
5' 11"	122	129	136	143	151	158	165	172	179	187	194	201	208	215	222	230	237	244	251	258	265	273	280	287
6'	125	133	140	148	155	162	170	177	184	192	199	207	214	221	229	236	243	251	258	266	273	280	288	295
6' 1"	129	137	144	152	159	167	174	182	190	197	205	212	220	228	235	243	250	258	265	273	281	288	296	303
6' 2"	132	140	148	156	164	171	179	187	195	203	210	218	226	234	242	249	257	265	273	281	288	296	304	312
6' 3"	136	144	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	280	288	296	304	312	320
6' 4"	140	148	156	164	173	181	189	197	206	214	222	230	238	247	255	263	271	280	288	296	304	312	321	329

FIGURE 14.3 Body mass index (BMI). To determine your BMI, find your height in the left column. Move across the appropriate row until you find the weight closest to your own. The number at the top of the column is the BMI at that height and weight.

SOURCE: Ratings from National Heart, Lung, and Blood Institute. 1998. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*. Bethesda, Md.: National Institutes of Health

the health risks of body weight for most average (nonathletic) people. BMI is correlated with body fat, but it does not directly measure body fat.

CALCULATING YOUR BMI BMI is calculated by dividing your body weight (expressed in kilograms or pounds) by the square of your height (expressed in meters or inches). You can look up your BMI in the chart in Figure 14.3, or you can use the following formula to calculate it more precisely:

$$\text{BMI} = \frac{\text{weight in kg}}{(\text{height in meters})^2}$$

OR

$$\frac{\text{weight in pounds}}{(\text{height in inches})^2} \times 703 \text{ (conversion factor)}$$

Body weight status is categorized as underweight, healthy weight, overweight, or obese in comparison with what is considered healthy for a given height. Under standards issued by the National Institutes of Health and adopted by the Dietary Guidelines for Americans, a BMI between 18.5 and 24.9 is considered healthy, a BMI of 25 or above is classified as overweight, and a BMI of 30 or above is classified as obese. A person with a BMI below 18.5 is classified as underweight, although low BMI values may be healthy in some cases if they are not the result of smoking, an eating disorder, or an underlying disease. A BMI of 17.5 or less is sometimes used as a diagnostic criterion for the eating disorder anorexia nervosa.

THE DRAWBACKS OF BMI BMI is a valuable tool for assessing weight, but it is not such a good tool for determining body composition. Like height–weight tables, it does not distinguish between fat weight and fat-free weight. It can also be inaccurate for some groups, including short people (under 5 feet tall), muscular athletes, and older adults with little muscle mass due to inactivity or an underlying disease. People in these groups should use one of the methods described in the next section for estimating percent body fat to assess whether their weight and body composition are healthy. BMI is also not particularly useful for tracking changes in body composition—gains in muscle mass and losses of fat. Women are likely to have more body fat for a given BMI than men.

Body Composition Analysis The most accurate and direct way to evaluate body composition is to determine percent body fat, and there are several methods to do so. However, specific guidelines for healthy body fat ranges have not been established. On average, women have about 10–12% more body fat than men. A healthy body fat range for men is usually considered to be about 12–20%, and for women, about 20–30%. Men with more than 25% body fat are considered obese, as are women with more than 33% body fat. No matter which method of body composition analysis is used, the measurements must be performed by someone with appropriate training to ensure accuracy.

SKINFOLD MEASUREMENT Skinfold measurement is a simple and practical way to assess body composition based on amount

of subcutaneous fat. A practitioner measures the thickness of skinfolds at several different sites on the body with special calipers, and the measurements are plugged into formulas that calculate body fat percentages. The accuracy of this method is highly dependent on the expertise of the practitioner.

BIOELECTRICAL IMPEDANCE ANALYSIS (BIA)

In this method, electrodes are attached to the body, and a harmless electrical current is transmitted from electrode to electrode. The electrical conduction through the body favors the path of the fat-free tissues over the fat tissues, so the amount of resistance to the current is related to the amount of fat-free tissue in the body. A computer then calculates fat percentages from measurements of the resistance to the current.

HYDROSTATIC WEIGHING AND THE BOD POD In hydrostatic (underwater) weighing, a person is submerged and weighed

To ensure accuracy, body composition measurements must be performed by someone with appropriate training.

under water. Percent body fat can be calculated from body density. Muscle has a higher density and fat a lower density than water, so people with more fat tend to float and weigh less under water, while lean people tend to sink and weigh more under water.

A specialized body composition analysis device called the Bod Pod uses air instead of water. A person sits in a chamber, and computerized pressure sensors determine the amount of air displaced by the person's body to determine percentage of body fat.

SCANNING PROCEDURES High-tech scanning procedures are very accurate means of assessing body composition, but they require expensive equipment. These procedures include computed tomography (CT), magnetic resonance imaging (MRI), dual-energy X-ray absorptiometry (DEXA), and dual-photon absorptiometry. Other procedures include infrared reactance (Futrex 1100) and total body electrical conductivity (TOBEC). These techniques are generally offered only at medical or research facilities.

Body Fat Distribution As noted earlier, the location of fat on your body also has implications for health, with abdominal fat posing a greater risk than fat located in other places. Abdominal fat appears to be an independent risk factor regardless of BMI.

Two of the simplest methods for measuring body fat distribution are waist circumference measurement and waist-to-hip ratio calculation. In the first method, you measure your waist circumference using a tape measure placed around your abdomen at the top of your hip bone. A waist circumference of ≥ 40 inches (102cm) for men or ≥ 35 in (88 cm) for women is associated with an increased risk for chronic disease for most adults. In the second method, you divide your waist circumference by your hip circumference (measured around the widest part of the buttocks). A waist-to-hip ratio above 0.94 for young men and above 0.82 for young women is associated with an increased risk of heart disease and diabetes. More research is needed to determine the precise degree of risk associated with specific values for these two assessments of body fat distribution.

EXCESS BODY FAT AND WELLNESS

The amount and distribution of fat in the body can have profound effects on health. Obesity doubles mortality rates and can reduce life expectancy by 10–20 years. In fact, if the current trends in overweight and obesity (and their related health problems) continue, some experts predict that the average American's life expectancy will soon decline by 5 years.

Obese people have an increased risk of death from all causes compared with people of normal weight. Obesity is associated with diabetes, cardiovascular diseases, many kinds of cancer, impaired immune function, gallbladder and kidney diseases,



Skinfold measurements are a simple and inexpensive way to determine body fat levels. This method requires a caliper designed for this purpose and a practitioner trained in its use.

skin problems, impotence, sleep and breathing disorders, back pain, arthritis, and other bone and joint disorders. Obesity is also associated with complications of pregnancy, menstrual irregularities, urine leakage (stress incontinence), increased surgical risk, and psychological disorders and problems (such as depression, low self-esteem, and body dissatisfaction).

There is debate over the health risks for people who are overweight but not obese (BMI of 25 to 29), particularly for people who are overweight and physically active. These risks depend in part on an individual's overall health and other risk factors, such as high blood pressure, unhealthy cholesterol levels, body fat distribution, tobacco use, and level of physical activity. The Nurses' Health Study, in which Harvard researchers have followed more than 120,000 women since 1976, has found that even mildly to moderately overweight women have an 80% increased risk of developing coronary heart disease (CHD) compared to leaner women.

This conclusion was supported by a 10-year study that ended in 2006 after following a half-million Americans in their fifties. Researchers concluded that subjects who were even slightly overweight were up to 40% more likely to die within the next decade, compared to age-matched people who had a desirable weight. But it is also important to realize that small weight losses—5% to 10% of total body weight—can lead to significant health improvements.

Diabetes

About 26 million Americans have one of the two major types of **diabetes mellitus**, a disease that disrupts normal metabolism. About 5–10% of people with diabetes have a form known as type 1 diabetes, a disease that usually begins in childhood or adolescence and is not related to obesity. The remaining 90–95% of people with diabetes have type 2 diabetes, a disease that is strongly associated with excess body fat. The prevalence of type 2 diabetes has been rising dramatically in parallel with the increase in prevalence of obesity. In 2010 almost 2 million new cases of diabetes were diagnosed in adults over the age of 20.

Diabetes involves the production of the hormone insulin by the pancreas. In normal metabolism, the pancreas secretes insulin, which stimulates cells to take up blood sugar (glucose) to produce energy (Figure 14.4; see also page T2-5 of the color transparency insert "Touring the Cardiorespiratory

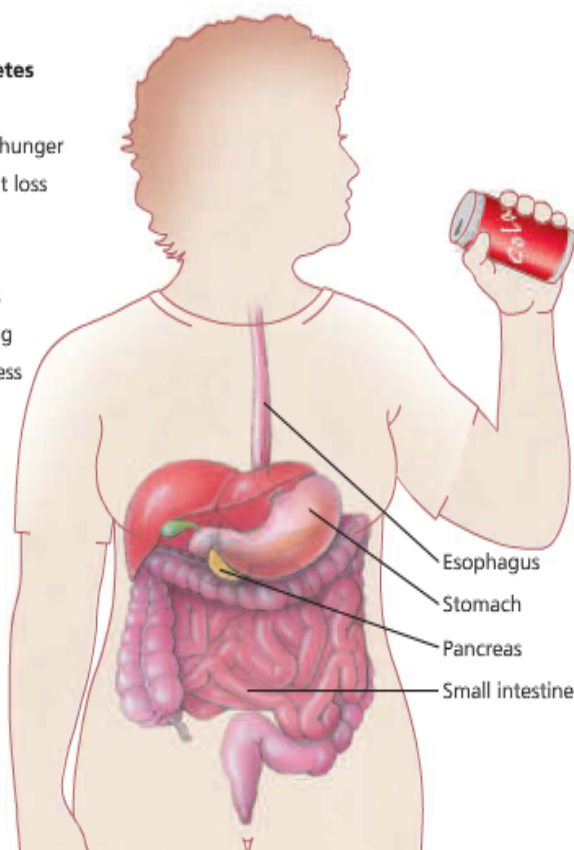
diabetes mellitus A disease that disrupts normal metabolism, interfering with cells' ability to take in glucose for energy production.

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Symptoms of diabetes

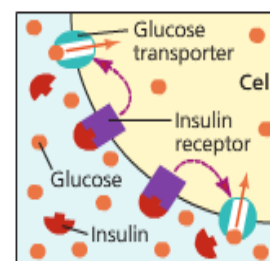
- Frequent urination
- Extreme thirst and hunger
- Unexplained weight loss
- Extreme fatigue
- Blurred vision
- Frequent infections
- Slow wound healing
- Tingling or numbness in hands and feet
- Dry, itchy skin

Note: In the early stages, diabetes often has no symptoms.



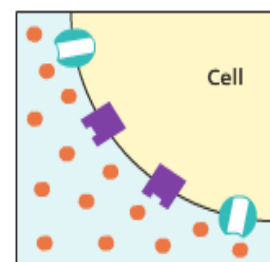
Normal

Insulin binds to receptors on the surface of a cell and signals special transporters in the cell to transport glucose inside.



Type 1 diabetes

The pancreas produces little or no insulin. Thus, no signal is sent instructing the cell to transport glucose, and glucose builds up in the bloodstream.



Type 2 diabetes

The pancreas produces too little insulin and/or the body's cells are resistant to it. Some insulin binds to receptors on the cell's surface, but the signal to transport glucose is blocked. Glucose builds up in the bloodstream.

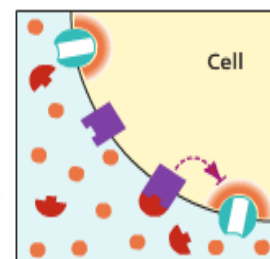


FIGURE 14.4 Diabetes mellitus. During digestion, carbohydrates are broken down in the small intestine into glucose, a simple sugar that enters the bloodstream. The presence of glucose signals the pancreas to release insulin, a hormone that helps cells take up glucose; once inside a cell, glucose can be converted to energy. In diabetes, this process is disrupted, resulting in a buildup of glucose in the bloodstream.

System” in Chapter 15). In diabetes, this process is disrupted, causing a buildup of glucose in the bloodstream. In type 1 diabetes, the body’s immune system, triggered by a viral infection or some other environmental factor, destroys the insulin-producing cells in the pancreas. Little or no insulin is produced, so daily doses of insulin are required. In type 2 diabetes, the pancreas doesn’t produce enough insulin, or body cells are resistant to insulin (called *insulin resistance*), or both. This condition can develop slowly, and about 25% of type 2 diabetics are unaware of their condition. About one-third of people with type 2 diabetes must take insulin; others may take medications that increase insulin production or stimulate the cells to take up glucose.

A third type of diabetes, called *gestational diabetes*, occurs in about 7% of women during pregnancy. The condition usually disappears after pregnancy, but about half of women who experience it eventually develop type 2 diabetes. *Prediabetes* is a condition in which blood sugar levels are higher than normal but not high enough for a diagnosis of full-blown diabetes. About 57 million Americans have prediabetes, and most will develop type 2 diabetes unless they adopt preventive lifestyle measures. The warning signs of diabetes include frequent urination, extreme hunger or thirst, unexplained weight loss, extreme fatigue, blurred vision, frequent infections, tingling or numbness in the hands or feet, and generalized itching with no rash.

Complications of diabetes include kidney failure; nerve damage; circulation problems and amputations; retinal damage and blindness; and increased rates of heart attack, stroke, and hypertension. Diabetes is currently the seventh leading cause of death in the United States.

The major risk factors for diabetes are age, obesity, physical inactivity, a family history of diabetes, and lifestyle. Ethnicity also plays a role, with Native Americans, Alaska Natives, African Americans, and Hispanics having higher rates than Asian Americans and white Americans. Excess body fat reduces cell sensitivity to insulin, and insulin resistance is almost always a precursor of type 2 diabetes. Nearly 90% of people with type 2 diabetes are overweight when diagnosed, including 55% who are obese.

It is estimated that 90% of cases of type 2 diabetes could be prevented if people adopted healthy lifestyle behaviors, including regular physical activity, a moderate diet to control body fat, and modest weight loss. Even a small amount of weight loss can be beneficial. For people with prediabetes, lifestyle measures are more effective than medication for delaying or preventing the development of diabetes. Exercise (endurance and/or strength training) makes cells more sensitive to insulin and helps stabilize blood glucose levels; it also helps keep body fat at healthy levels. Regular exercise and a healthy diet are often sufficient to control type 2 diabetes. There is no cure for diabetes, but it can

be successfully managed by keeping blood sugar levels within safe limits through diet, exercise, and, if necessary, medication.

Obesity is one of the six major controllable risk factors for heart disease. Excess body fat is strongly associated with hypertension, unhealthy cholesterol and triglyceride levels, and impaired heart function. Many overweight and obese people—especially those who are sedentary and eat a poor diet—also suffer from a group of symptoms called *metabolic syndrome*. Symptoms include insulin resistance, high blood pressure, high blood glucose, unhealthy cholesterol levels, chronic inflammation, and abdominal fat. Metabolic syndrome increases the risk of heart disease, more so in men than in women (see Chapter 15 for more about metabolic syndrome).

Obesity is also a risk factor for certain types of cancer, including colon and rectal cancer, breast cancer, prostate cancer, and ovarian cancer (see Chapter 16).

QUICK STATS

More than one-third of children and adolescents in the United States are overweight or obese.

—CDC, 2012

Body Fat Distribution and Health

As noted earlier, the distribution of body fat (that is, the locations of fat on the body) is an important indicator of health. Men and postmenopausal women tend to store fat in the upper regions of their bodies, particularly in the abdominal area, as visceral fat. People with this pattern of fat distribution, called *android obesity*, are said to be apple-shaped. Premenopausal women usually store fat in the hips, buttocks, and thighs, as subcutaneous fat. People with this pattern, called *gynoid obesity*, are said to be pear-shaped.

Abdominal obesity increases the risk of high blood pressure, diabetes, early-onset heart disease, stroke, certain types of cancer, and mortality. This risk is independent of a person’s BMI. Even people who have a BMI in the normal range may be at increased risk of diabetes, high blood pressure, and CVD if they have a large waist circumference, particularly if they have additional risk factors. For example, a man with a BMI of 27, a waist circumference above 40 inches, and diabetes is at greater risk for health problems than another man who has a BMI of 27 but has a smaller waist and no other risk factors. Abdominal obesity (as measured by waist circumference) is a primary component of metabolic syndrome and a forewarning of diabetes and heart disease.

The reason for the increased risk associated with abdominal obesity appears to be that visceral fat is more easily mobilized and sent into the bloodstream, increasing disease-related blood fat levels. Visceral fat contains many biologically active substances such as inflammatory chemicals and growth factors, which can adhere to the lining of blood vessels, cause insulin resistance, and have a negative influence on cardiovascular



Overweight men tend to have an apple shape (android obesity).
Overweight women tend to have a pear shape (gynoid obesity).

health. Subcutaneous fat tends to be soft and flabby (whereas visceral fat is hard) and is not metabolically active the way visceral fat is.

Body Image

The collective picture of the body as seen through the mind's eye, **body image** consists of perceptions, images, thoughts, attitudes, and emotions. A negative body image is characterized by dissatisfaction with the body in general or some part of the body in particular. Recent surveys indicate that the majority of Americans, many of whom are not actually overweight, are unhappy with their body weight or with some aspect of their appearance. People may be dissatisfied with their bodies for a variety of reasons, including sociocultural forces and factors that are specific to life stages. For example, the ideal female body size in Western society has become progressively thinner while actual female body size continues to increase, along with the frequency of unhealthy attitudes and behaviors surrounding food and body weight.

Losing weight or getting cosmetic surgery does not necessarily improve body image. However, improvements in body image may occur in the absence of changes in weight or appearance. Many experts now believe that body image issues must be dealt with as part of treating obesity and eating disorders. Body image and eating disorders are discussed in detail later in this chapter.

Problems Associated with Very Low Levels of Body Fat

Health experts have generally viewed very low levels of body fat—less than 8–12% for women and 3–5% for men—as a threat to wellness. Extreme leanness has been linked with reproductive, circulatory, and immune system disorders. Extremely lean people may experience muscle wasting and fatigue; they are also more likely to suffer from dangerous eating disorders.

In physically active women and girls, particularly those involved in sports where weight and appearance are important (ballet, gymnastics, skating, and distance running, for example), a condition called the **female athlete triad** may develop (Figure 14.5). The triad consists of three interrelated disorders: abnormal eating patterns (and excessive exercising), followed by **amenorrhea** (absence of menstruation), followed by decreased bone density (premature osteoporosis). Prolonged amenorrhea can cause bone density to erode to a point that a woman in her twenties will have the bone density of a woman in her sixties. Left untreated, the triad can lead to decreased physical performance, increased incidence of bone fractures, disturbances of heart rhythm and metabolism, and even death.

What Is the Right Weight for You?

To answer the question of what you should weigh, let your lifestyle be your guide. Don't focus on a particular weight as your goal. Instead focus on living a lifestyle that includes

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Calculate your BMI using the formula given in this chapter; then compare it with the BMIs of some classmates. Do the results surprise you? How well do you think BMI reflects body composition? Why do you think it is such a commonly used measure?

body image The mental representation a person holds about his or her body at any given time, consisting of perceptions, images, thoughts, attitudes, and emotions about the body.

female athlete triad A condition consisting of three interrelated disorders: abnormal eating patterns (and excessive exercising) followed by lack of menstrual periods (amenorrhea) and decreased bone density (premature osteoporosis).

amenorrhea The absence of menstruation.

TERMS



WELLNESS ON CAMPUS

The Freshman 15: Fact or Myth?

According to popular belief, college students typically gain 15 pounds in their first year at school—the infamous “freshman 15.” Is this the fate of all college students, or is it a myth that adds stress for body-conscious young adults?

Research indicates that the truth lies somewhere between these two scenarios. While many people do gain weight in the first year at college, the weight gain tends to be less than 5 pounds. A 2011 study found that freshmen gain between 2.5 and 3.5 pounds, on average, during their first year. This is only half a pound more than is gained by individuals of the same age who are not attending college. Reasons for the weight gain include newfound food independence, changes in eating habits, stress, and social comparison and the influence of roommates and friends.

Although 5 pounds may not seem like a lot of weight, it still can pose a health risk or contribute to lower self-esteem. Changes in body composition—specifically, increased body fat—can begin a troublesome pattern for students. Even if they don’t have a spike in weight during their first year, college-educated individuals tend to experience a moderate but steady weight gain during and after college.

More importantly, whether the weight gain is 5 pounds, 15 pounds, or even more, freshman weight gain is avoidable! In addition to the healthy eating strategies for college students

described in Chapter 12, try following these tips and guidelines for avoiding freshman weight gain:

- Listen to your hunger cues.
- Watch portion sizes, and avoid second and third servings.
- Follow a daily schedule for your meals and snack times.
- Don’t skip meals—especially breakfast.
- Plan ahead so you have healthy snacks in your room.
- Eat when you are hungry—not for emotional reasons.
- If you cook, try to shop at a regular grocery store and not a campus convenience store.
- Avoid late-night eating.
- Be more physically active: walk to and from class, use the campus fitness facility, and consider taking a sports class for credit (tennis, dance, aerobics, weight training).

SOURCES: Zagorsky, J. L., and P. K. Smith. 2011. The freshman 15: critical time for obesity intervention or media myth? *Social Science Quarterly*, 92(5): 1389–1407; Smith-Jackson, T., and J. J. Reed. 2012. Freshman women and the “Freshman 15”: perspectives on prevalence and causes of college weight gain. *Journal of American College Health*, 60(1): 14–20; Yakusheva, O., K. Kaplanos, and M. Weiss. 2011. Peer effects and the freshman 15: evidence from a natural experiment. *Economics & Human Biology* 9(2):119–132.

eating moderate amounts of healthful foods, getting plenty of exercise, thinking positively, and learning to cope with stress. Then let the pounds fall where they may. For most people, the result will be close to the recommended weight ranges discussed earlier. For some, their weight will be

somewhat higher than societal standards—but right for them. By letting a healthy lifestyle determine your weight, you can avoid developing unhealthy patterns of eating and a negative body image.

Because overweight and obesity are risk factors for chronic disease, people who are currently overweight should make preventing additional weight gain and managing risk factors for disease their important priorities (Table 14.2). Obese adults should strive to change their calorie balance to promote weight loss by making changes to their diet and level of physical activity.

FACTORS CONTRIBUTING TO EXCESS BODY FAT

Body weight and body composition may be determined by multiple factors that may vary with each individual. These factors can be grouped into genetic, physiological, lifestyle, and psychosocial factors.

Genetic Factors

Nutrigenomics is the study of how nutrients and genes interact and how genetic variations can cause people to respond differently to nutrients in food. Estimates of the genetic contribution to obesity vary widely, from about 25% to 40% of an

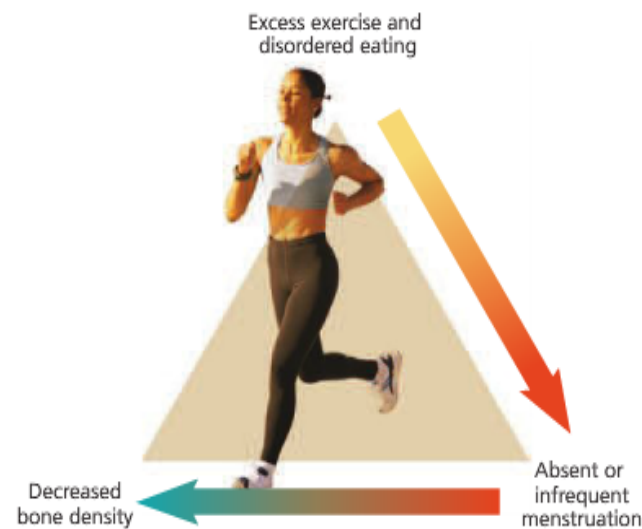


FIGURE 14.5 Female athlete triad Some girls and women striving for unrealistic thinness develop a condition called the female athlete triad. Disordered eating combined with intense exercise can suppress the hormones that control the menstrual cycle, and absence of menstrual periods can lead to osteoporosis.

Table 14.2

Body Mass Index (BMI) Classification and Disease Risk

CLASSIFICATION	BMI (kg/m ²)	OBESITY CLASS	DISEASE RISK RELATIVE TO NORMAL WEIGHT AND WAIST CIRCUMFERENCE ^a	
			MEN ≤ 40 in. (102 cm) WOMEN ≤ 35 in. (88 cm)	> 40 in. (102 cm) > 35 in. (88 cm)
Underweight ^b	<18.5		—	—
Normal ^c	18.5–24.9		—	—
Overweight	25.0–29.9		Increased	High
Obesity	30.0–34.9	I	High	Very high
	35.0–39.9	II	Very high	Very high
Extreme obesity	≥ 40.0	III	Extremely high	Extremely high

^aDisease risk for type 2 diabetes, hypertension, and cardiovascular disease. The waist circumference cutoff points for increased risk are 40 inches (102 cm) for men and 35 inches (88 cm) for women.

^bResearch suggests that a low BMI can be healthy in some cases, as long as it is not the result of smoking, an eating disorder, or an underlying disease process.

A BMI of 17.5 or less is sometimes used as a diagnostic criterion for the eating disorder anorexia nervosa.

^cIncreased waist circumference can also be a marker for increased risk, even in people of normal weight.

SOURCE: Adapted from National Heart, Lung, and Blood Institute. 1998. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*. Bethesda, MD: National Institutes of Health.

individual's body fat. Scientists have so far identified more than 600 genes associated with obesity. Genes influence body size and shape, body fat distribution, and metabolic rate. Genetic factors also affect the ease with which weight is gained as a result of overeating and where on the body extra weight is added.

If both parents are obese, their children have an 80% risk of being obese; children with only one obese parent face a 50% risk of becoming obese. In studies that compared adoptees and their biological parents, the weights of the adoptees were found to be more like those of the biological parents than those of the adoptive parents, again indicating a strong genetic link.

Hereditary influences, however, must be balanced against the contribution of environmental factors. Not all children of obese parents become obese, and normal-weight parents may have overweight children. Environmental factors like diet and exercise are probably responsible for such differences. Thus the *tendency* to develop obesity may be inherited, but the expression of this tendency is affected by environmental influences.

The message you should get from this research is that genes are not destiny. It is true that some people have a harder time losing weight and maintaining weight loss than others. However, with increased exercise and attention to diet, even those with a genetic tendency toward obesity can maintain a healthy body weight. And regardless of genetic factors, lifestyle choices remain the cornerstone of successful weight management.

Physiological Factors

Metabolism is a key physiological factor in the regulation of body fat and body weight; hormones and fat cell types also play a role.

Metabolism Metabolism is the sum of all the vital processes by which food energy and nutrients are made available to and used by the body. The largest component of metabolism, **resting metabolic rate (RMR)**, is the energy required to maintain vital body functions, including respiration, heart rate, body temperature, and blood pressure, while the body is at rest. As shown in Figure 14.2, RMR accounts for about 65–70% of daily energy expenditure. The energy required to digest food accounts for as much as 10% of daily energy expenditure. The remaining 20–30% is expended during physical activity.

Both genetics and behavior affect metabolic rate. Men, who have a higher proportion of muscle mass than women, have a higher RMR because muscle tissue is more metabolically active than fat. Also, some individuals inherit a higher or lower RMR than others. A higher RMR means that a person burns more calories while at rest and can therefore take in more calories without gaining weight.

Weight loss or gain also affects metabolic rate. When a person loses weight, both RMR and the energy required to perform physical tasks decrease. The reverse occurs when weight is gained. One of the reasons why exercise is so important during a weight loss program is that exercise, especially resistance training, helps maintain muscle mass and metabolic rate.

QUICK

STATS

An obese teenager has a 70% risk of becoming an obese adult.

—U.S. Dept. of Health and Human Services, 2010

resting metabolic rate (RMR) The energy required to maintain vital body functions, including respiration, heart rate, body temperature, and blood pressure, while the body is at rest.

TERMS

Hormones Hormones clearly play a role in the accumulation of body fat, especially for females. Hormonal changes at puberty, during pregnancy, and at menopause contribute to the amount and location of fat accumulation. For example, during puberty, hormones cause the development of secondary sex characteristics, including larger breasts, wider hips, and a fat layer under the skin.

One hormone thought to be linked to obesity is *leptin*. Secreted by the body's fat cells, leptin is carried to the brain, where it appears to let the brain know how big or small the body's fat stores are. With this information, the brain can regulate appetite and metabolic rate accordingly. Several other hormones, such as ghrelin, may be involved in the regulation of appetite. Researchers hope to use these hormones to develop treatments for obesity based on appetite control; however, as most of us will admit, hunger is often *not* the primary reason we overeat. Cases of obesity based solely or primarily on hormone abnormalities do exist, but they are rare.

Fat Cells The amount of fat (adipose tissue) the body can store is a function of the number and size of fat (adipose) cells. These fat cells are like little compartments that can inflate to hold body fat; when existing fat cells are filled, the body makes more, thereby increasing its ability to store fat.

Some people are born with an above-average number of fat cells and thus have the potential for storing more energy as body fat. Overeating at critical times, such as in childhood, can cause the body to create more fat cells. If a person loses weight, fat cell content is depleted, but it is unclear whether the number of fat cells can be decreased.

Further, it appears that all fat cells are not created equal. As mentioned earlier, visceral fat, located in the abdomen, is more metabolically active than subcutaneous fat and poses more health risks.

Lifestyle Factors

Although genetic and physiological factors may increase the risk for excess body fat, they are not sufficient to explain the increasingly high rate of obesity seen in the United States. The gene pool has not changed dramatically in the past 60 years, but the rate of obesity among Americans has more than doubled (see the box "Overweight and Obesity among U.S. Ethnic Populations"). Clearly other factors are at work—particularly lifestyle factors such as increased eating and decreased physical activity.

Eating Americans have access to plenty of calorie-dense foods, and many have eating habits that contribute to weight gain. Most overweight adults admit to eating more than they should of high-fat, high-sugar, high-calorie foods. Americans eat out more frequently now than in the past and rely more heavily on fast food and packaged convenience foods. Restaurant and convenience food portion sizes tend to be large, and the foods themselves are likely to

be high in fat, sugar, and calories and low in nutrients. Many people underestimate the actual number of calories they eat.

Research indicates that when more food is available, people eat more. Many of the extra calories consumed by Americans come from carbohydrates, such as refined sugars, fats, and full-fat milk and milk products. The popularity of sugar-free soft drinks does not appear to be helping people lose weight, though it is not yet clear why this may be the case. Compared to people who don't drink soda, people who drink more than one soda per day, either regular or diet, are more likely to be obese, develop metabolic syndrome, and have high blood pressure.

Physical Activity Activity levels among Americans are declining, beginning in childhood and continuing throughout life. Many schools have cut back on physical education classes and recess. Most adults drive to work, sit all day, and then relax in front of the TV at night. Incidence of overweight is consistently linked to excessive screen time—whether time spent watching TV, playing video games, or using computers. Fewer than 5% of American adults participate in daily physical activity for at least 30 minutes.

An "Obesogenic" Environment The 2010 Dietary Guidelines for Americans focused attention on the "obesogenic" environment in which most Americans live. This environment promotes overconsumption of calories while at the same time discouraging physical activity. Food and activity choices are influenced by the communities in which individuals live, their socioeconomic status, religion and culture, and geographic location. People living in areas with limited access to healthy foods and opportunities for physical activity do not have the same options for choosing a healthy lifestyle as do people living in more enriched environments.

Psychosocial Factors

Many people have learned to use food as a means of coping with stress and negative emotions. Eating can provide a powerful distraction from difficult feelings—loneliness, anger, boredom, anxiety, shame, sadness, inadequacy. It can be used to combat low moods, low energy levels, and low self-esteem (see the box "What Triggers Your Eating?"). When food and eating become the primary means of regulating emotions, binge eating or other disturbed eating patterns can develop.

Obesity is strongly associated with socioeconomic status. The prevalence of obesity in women and children tends to go down as income level goes up, though it stays the same in men. These differences may reflect the greater sensitivity and concern for a slim physical appearance among upper-income women, as well as greater access to

DIVERSITY MATTERS

Overweight and Obesity among U.S. Ethnic Populations



The prevalence of overweight and obesity is growing among all population groups in the United States. However, rates and trends vary by ethnic group and by other population characteristics.

- Certain groups, including African Americans, Latinos, and American Indians and Alaska Natives, have higher-than-average rates of obesity. Asian Americans have a low rate of obesity.
- The process of acculturation into mainstream culture in the United States boosts body weight. The longer a foreign-born person lives in the United States, the more likely she or he is to become obese. BMI among immigrants begins to climb after about 10 years of U.S. residence, and after 15 years, it approaches the national average.
- Cultural factors that influence dietary and exercise behaviors appear to play a role in the development of obesity. There are also cultural differences in acceptance of larger body size and in body image perception. For example, one study found that African Americans were more likely to think they were thinner than they really were and whites were more likely to think they were fatter than they really were.
- The health consequences of obesity affect ethnic populations in different ways. At a given level of BMI, Latinos are significantly more likely to have type 2 diabetes than whites. Obesity in African Americans is associated with increased risk of developing hypertension at a younger age and in a more severe form.
- For Asian Americans or people of Asian descent, waist circumference is a better indicator of relative disease risk than BMI, and disease risk goes up at a lower level of



BMI than for individuals of other groups. For Asian populations, WHO guidelines have a lower BMI cutoff for defining overweight (BMI 23).

- The prevalence of obesity differs among racial and ethnic groups in the United States in children as young as age 4. Obesity is twice as common in young American Indian/Native Alaskan children as it is in white and Asian children, and obesity prevalence is higher in Hispanic and black children than it is in whites and Asians.
- Fast-food restaurants are more prevalent in low-income areas compared with middle- to higher-income areas and in areas with higher concentrations of ethnic minority groups in comparison with Caucasians. Higher BMIs may be associated with living in areas with increased expo-

sure to fast food, although there is some debate about this.

SOURCES: Anderson, S. E., and R. C. Whitaker. 2009. Prevalence of obesity among US preschool children in different racial and ethnic groups. *Archives of Pediatrics and Adolescent Medicine*, 163(4): 344–348; Fleischhacker, S. E., et al. 2011. A systematic review of fast food access studies. *Obesity Reviews*, 12(5): e460–471; Ogden, C. L., et al. 2010. Obesity and socioeconomic status in adults: United States, 2005–2008. NCHS Data Brief, 50: 1–8. (<http://www.ncbi.nlm.nih.gov/pubmed/21211165>); Kumanyika, S., and S. Grier. 2006. Targeting interventions for ethnic minority and low-income populations. *The Future of Children* 16(1): 187–207, 578–584; Goel, M. S., et al. 2004. Obesity among U.S. immigrant subgroups by duration of residence. *Journal of the American Medical Association* 292(23): 2860–2867.

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Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How do you view your own body composition? Where do you think you've gotten your ideas about how your body should look and perform? In light of what you've read in this chapter, do the ideals and images promoted in our culture seem reasonable? Do they seem healthy?

information about nutrition, to low-fat and low-calorie foods, and to opportunities for physical activity. It may also reflect the greater acceptance of obesity among certain ethnic groups, as well as different cultural values related to food choices.

In some families and cultures, food is used as a symbol of love and caring. It is an integral part of social gatherings and celebrations. In such cases, it may be difficult to change established eating patterns because they are linked to cultural and family values.

ADOPTING A HEALTHY LIFESTYLE FOR SUCCESSFUL WEIGHT MANAGEMENT

When all the research has been assessed, it is clear that most weight problems are lifestyle problems. Despite the growing prevalence of obesity in children and adolescents, many young adults get away with very unhealthy eating and exercise habits and don't develop a weight problem. But as the rapid growth of adolescence slows and family and career obligations increase, maintaining a healthy weight becomes a greater challenge. Slow weight gain—just one or two pounds per year—is a major cause of overweight and obesity, so weight management is important for everyone, not just for people who are currently overweight. A good time to develop a lifestyle for successful weight management is during early adulthood, when healthy behavior patterns have a better chance of taking a firm hold.

Permanent weight loss is not something you should start and stop. You need to adopt healthy behaviors that you can maintain throughout life, including eating habits, level of physical activity, an ability to think positively and manage your emotions effectively, and the coping strategies you use to deal with the stresses and challenges in your life.

Diet and Eating Habits

In contrast to dieting, which involves some form of food restriction, the term *diet* refers to your daily food choices. Everyone has a diet, but not everyone is dieting. You need to develop a diet that you enjoy and that enables you to maintain a healthy body composition. Use MyPlate or the DASH Eating Plan as the basis for a healthy diet (see Chapter 12). For weight management, pay special attention to total calories, portion sizes, energy density, fat and carbohydrate intake, and eating habits.

Total Calories MyPlate suggests approximate daily energy needs based on gender, age, and activity level. However, energy balance may be a more important consideration for weight management than total calories consumed (refer back to Figure 14.2). To maintain your current weight, the total number of calories you eat must equal the number you burn. To lose weight, you must decrease your calorie intake and/or increase the number of calories you burn; to gain weight, the reverse is true. (One pound of body fat represents 3500 calories.)

The best approach for weight loss is combining an increase in physical activity with moderate calorie restriction. Don't go on a crash diet. To maintain weight loss, you may need to maintain some degree of the calorie restriction you used to lose the weight. Therefore, you need to adopt a level of food intake that provides all the essential nutrients that you can live with over the long term. For most people, maintaining weight loss is more difficult than losing the weight in the first place.

Portion Sizes Overconsumption of total calories is closely tied to portion sizes. Many Americans are unaware that the portions of packaged foods and of foods served at restaurants have increased in size, and most of us significantly underestimate the amount of food we eat. Studies have found that the larger the meal, the more calories people tend to eat. People also commonly eat much more of the foods that they perceive as being healthy, and in the process consume far more calories than they need. Portion size is associated with body weight, so limiting portion sizes is critical for maintaining a healthy body weight. For many people, concentrating on portion sizes is easier than counting calories.

Energy (Calorie) Density Experts also recommend that you pay attention to *energy density*—the number of calories per ounce or gram of weight in a food. Ice cream, potato chips, croissants, crackers, and cakes and cookies are examples of foods high in energy density. Studies suggest that it isn't consumption of a certain amount of fat or calories in food that reduces hunger and leads to feelings of fullness and satisfaction; rather, it is consumption of a certain weight of food. Foods that are low in energy density have more volume and bulk—that is, they are relatively heavy but have few calories (see Table 14.3). For example, for the same 100 calories, you could eat 21 baby carrots or 4 pretzel twists; you are more likely to feel full after eating the serving of carrots because it weighs 10 times as much as the serving of pretzels (10 ounces versus 1 ounce).

As you decrease foods high in energy density, increase foods high in nutrient density—foods that are low in calories and high in nutrients. For example, fresh fruits and vegetables, with their high water and fiber content, are low in calories and high in nutrients, as are whole-grain foods. Fresh fruits contain fewer calories and more fiber than fruit juices or drinks. Strategies

One pound of body fat represents 3500 calories.

Table 14.3 Examples of Foods Low in Energy Density

FOOD	AMOUNT	CALORIES
Carrot, raw	1 medium	25
Popcorn, air popped	2 cups	62
Apple	1 medium	72
Vegetable soup	1 cup	72
Plain instant oatmeal	½ cup	80
Fresh blueberries	1 cup	80
Corn on the cob (plain)	1 ear	80
Cantaloupe	½ melon	95
Light (fat-free) yogurt with fruit	6 oz.	100
Unsweetened applesauce	1 cup	100
Pear	1 medium	100
Corn flakes	1 cup	101
Sweet potato, baked	1 medium	120

ASSESS YOURSELF

What Triggers Your Eating?



Hunger isn't the only reason people eat. Efforts to maintain a healthy body weight can be sabotaged by eating related to other factors, including emotions, environment, and patterns of thinking. This quiz is designed to provide you with a score for five fac-

tors that describe many people's eating habits. This information will put you in a better position to manage your eating behavior and control your weight. Circle the number that indicates to what degree each situation is likely to make you start eating.

Social

1. Arguing or having a conflict with someone
2. Being with others when they are eating
3. Being urged to eat by someone else
4. Feeling inadequate around others

Emotional

5. Feeling bad, such as being anxious or depressed
6. Feeling good, happy, or relaxed
7. Feeling bored or having time on my hands
8. Feeling stressed or excited

Situational

9. Seeing an advertisement for food or eating
10. Passing by a bakery, cookie shop, or other enticement to eat
11. Being involved in a party, celebration, or special occasion
12. Eating out

Thinking

13. Making excuses to myself about why it's OK to eat
14. Berating myself for being fat or unable to control my eating
15. Worrying about others or about difficulties I'm having
16. Thinking about how things should or shouldn't be

Physiological

17. Experiencing pain or physical discomfort
18. Experiencing trembling, headache, or light-headedness associated with not eating or too much caffeine
19. Experiencing fatigue or feeling overtired
20. Experiencing hunger pangs or urges to eat, even though I've eaten recently

Scoring

Total your scores for each category, and enter them below. Then rank the scores by marking the highest score 1, next highest score 2, and so on. Focus on the highest-ranked categories first, but any score above 24 is high and indicates that you need to work on that category.

Category	Total Score	Rank Order
Social (Items 1–4)	_____	_____
Emotional (Items 5–8)	_____	_____
Situational (Items 9–12)	_____	_____
Thinking (Items 13–16)	_____	_____
Physiological (Items 17–20)	_____	_____

What Your Score Means

Social A high score here means you are very susceptible to the influence of others. Work on better ways to communicate more assertively, handle conflict, and manage anger. Challenge your beliefs about the need to be polite and the obligations you feel you must fulfill.

Emotional A high score here means you need to develop effective ways to cope with emotions. Work on developing skills in stress management, time management, and communication. Practicing positive but realistic self-talk can help you handle small daily upsets.

Very Unlikely

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

Very Likely

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10
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Situational A high score here means you are especially susceptible to external influences. Try to avoid external cues and respond differently to those you cannot avoid. Control your environment by changing the way you buy, store, cook, and serve food. Anticipate potential problems, and have a plan for handling them.

Thinking A high score here means that the way you think—how you talk to yourself, the beliefs you hold, your memories, and your expectations—has a powerful influence on your eating habits. Try to be less self-critical, less perfectionistic, and more flexible in your ideas about the way things ought to be. Recognize when you're making excuses or rationalizations that allow you to eat.

Physiological A high score here means that the way you eat, what you eat, or medications you are taking may be affecting your eating behavior. You may be eating to reduce physical arousal or deal with physical discomfort. Try eating three meals a day, supplemented with regular snacks if needed. Avoid too much caffeine. If any medication you're taking produces adverse physical reactions, switch to an alternative, if possible. If your medications may be affecting your hormone levels, discuss possible alternatives with your physician.

SOURCE: "What Triggers Your Eating?" Adapted from Nash, J.D. 1997. *The New Maximize Your Body Potential*. Boulder, CO: Bull Publishing. Reprinted by permission.



CRITICAL CONSUMER

Evaluating Fat and Sugar Substitutes

Foods made with fat and sugar substitutes are often promoted for weight loss. But what are fat and sugar substitutes? And can they really contribute to weight management?

Fat Substitutes

A variety of substances are used to replace fats in processed foods and other products. Some contribute calories, protein, fiber, or other nutrients; others do not. Fat replacers fall into three general categories:

- **Carbohydrate-based fat replacers** are often found in dairy and meat products, baked goods, salad dressings, and many other prepared foods. Oatrim, Z-trim, and Nu-trim are made from types of dietary fiber that may actually lower cholesterol levels. Carbohydrate-based fat replacers contribute 0–4 calories per gram.
- **Protein-based fat replacers** are typically made from milk, egg whites, soy, or whey; trade names include Simplese, Dairy-lo, and Supro. They are used in cheese, sour cream, mayonnaise, margarine spreads, frozen desserts, salad dressings, and baked goods. Protein-based fat replacers typically contribute 1–4 calories per gram.
- **Fat-based fat replacers.** Some of these compounds are not absorbed well by the body and so provide fewer calories per gram (5 calories compared with the standard 9 for fats); others are impossible for the body to digest and so contribute no calories at all. Olestra, marketed under the trade name Olean and used in fried snack foods, is an example of the latter type of compound.

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for lowering the energy density of your diet while at the same time increasing its nutrient density include the following:

- Eat fruit with breakfast and for dessert.
- Add extra vegetables to sandwiches, casseroles, stir-fry dishes, pizza, pasta dishes, and fajitas.
- Start meals with a bowl of broth-based soup; include a green salad or fruit salad.
- Snack on fresh fruits and vegetables rather than crackers, chips, or other energy-dense snack foods.

Limit serving sizes of energy-dense foods such as butter, mayonnaise, cheese, chocolate, fatty meats, croissants, and snack foods that are fried, are high in added sugars (including reduced-fat products), or contain trans fats.

It is also important to watch out for processed foods, which can be high in fat and sodium. Even processed foods labeled “fat-free” or “reduced fat” may be high in calories; such products

Nonnutritive Sweeteners and Sugar Alcohols

Sugar substitutes are often referred to as nonnutritive sweeteners because they provide no calories or essential nutrients. The FDA has approved five types of nonnutritive sweeteners for use in the United States: acesulfame-K (Sunett, Sweet One), aspartame (NutraSweet, Equal, NatraTaste), saccharin (Sweet 'N Low), sucralose (Splenda), and neotame. They are used in beverages, desserts, baked goods, yogurt, chewing gum, and products such as toothpaste, mouthwash, and cough syrup. Another sweetener, stevia, is an extract of a South American shrub.

Sugar alcohols are made by altering the chemical form of sugars extracted from fruits and other plant sources; the best known of these is sorbitol. Sugar alcohols provide 0.2–2.5 calories per gram, compared to 4 calories per gram in standard sugar. They have typically been used to sweeten sugar-free candies but are now being added to many sweet foods that are promoted as low-carbohydrate products, often combined with other sweeteners.

Fat and Sugar Substitutes in Weight Management

Whether fat and sugar substitutes help you achieve and maintain a healthy weight depends on your overall eating and activity habits. The increase in the availability of fat-free and sugar-free foods in the United States has *not* been associated with a drop in calorie consumption. Reduced-fat foods often contain extra sugar to improve the taste and texture lost when fat is removed, so such foods may be as high or even higher in total calories than their fattier counterparts. If you consume low-fat, no-sugar-added ice cream instead of regular ice cream, you may save calories.

Finally, many of the foods containing fat and sugar substitutes are low-nutrient snack foods. Fruits, vegetables, and whole grains are healthier snack choices.

may contain sugar and fat substitutes (see the box “Evaluating Fat and Sugar Substitutes”). Stick to the calorie and nutrient recommendations offered by the Dietary Guidelines for Americans, MyPlate, or the DASH Eating Plan (see Chapter 12).

Eating Habits Equally important to weight management is the habit of eating regular meals daily, including breakfast and snacks. Skipping meals leads to excessive hunger, feelings of deprivation, and increased vulnerability to binge eating or unhealthy snacking. In addition to establishing a regular pattern of eating, set some rules to govern your food choices. Rules for breakfast might be these, for example: Choose a high-fiber cereal that is low in added sugar with fat-free milk on most days; save pancakes and waffles for special occasions unless they are whole-grain. For effective weight management, it is better to consume the majority of calories during the day when your activity levels are higher rather than in the evening.

EMBRACING WELLNESS

Exercise, Body Image, and Self-Esteem



If you gaze into the mirror and wish you could change the way your body looks, consider getting some exercise—not to reshape your contours but to firm up your body image and enhance your self-esteem. Adults who participate in exercise programs not only improve their fitness but also benefit psychologically in mood, self-concept, and reduced anxiety. People who exercise regularly often gain a sense of mastery and competence that enhances their self-esteem and body image. In addition, exercise contributes to a more toned look, which many adults prefer.

Research suggests that physically active people are more comfortable with their bodies and with their body image than sedentary people are. For example, employees

asked to complete a 36-session stretching program to prevent muscle strains at work improved not only in measurements of flexibility but also in perception of their bodies and overall sense of self-worth.

Similar results have been found in middle-aged people at risk for heart disease randomly assigned to one of four groups: diet, diet plus exercise, exercise, and no intervention. The greater the participation of individuals was in the exercise component of the program, the higher were their scores in perceived competence, self-esteem, and coping.



Decreeing some foods off-limits generally sets up a rule to be broken. A more sensible principle is “everything in moderation.” If a particular food becomes troublesome, place it off-limits until you gain control over it. The ultimate goal is to eat in moderation; no foods need to be entirely off-limits, though some should be eaten judiciously.

Physical Activity and Exercise

Regular physical activity is another important lifestyle factor in weight management (see Chapter 13). Physical activity and exercise burn calories and keep the metabolism geared to using food for energy instead of storing it as fat. Exercise has a positive effect on metabolism. When people exercise, they slightly increase the number of calories their bodies burn at rest (resting metabolic rate). They also increase their muscle mass, which is associated with a higher metabolic rate. The exercise itself also burns calories, raising total energy expenditure. The higher the energy expenditure, the more the person can eat without gaining weight.

Making significant cuts in food intake to lose weight is a difficult strategy to maintain; increasing your physical activity is a better approach. Regular physical activity protects against weight gain, is essential for maintaining weight loss, and improves quality of life (see the box “Exercise, Body Image, and Self-Esteem”). The sooner you establish good habits, the better. The key to success is making exercise an integral part of the lifestyle you can enjoy now and in the future.

For weight management, it's better to have the majority of calories during the day rather than in the evening.

Thinking and Emotions

The way you think about yourself and your world influences, and is influenced by, how you feel and how you act. In fact, research on people who have a weight problem indicates that low self-esteem and the negative emotions that accompany it are significant problems. Often people with low self-esteem mentally compare the actual self to an internally held picture of an “ideal self,” an image based on perfectionistic goals and beliefs about how they and others should be. The more these two pictures differ, the larger the impact on self-esteem and the more likely the presence of negative emotions.

Besides the internal picture we carry of ourselves, all of us carry on an internal dialogue about events happening to us and around us. This *self-talk* can be self-deprecating or positively motivating, depending on our beliefs and attitudes. Having realistic beliefs and goals, and practicing positive self-talk and problem solving, support a healthy lifestyle.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever used food as an escape when you were stressed out or distraught? Were you aware of what you were doing at the time? How can you avoid using food as a coping mechanism in the future?



TAKE CHARGE

Lifestyle Strategies for Successful Weight Management

Food Choices

- Follow the recommendations in MyPlate for eating a moderate, varied diet. Focus on making good choices from each food group.
- Favor foods with a high nutrient density.
- Check food labels for serving sizes, calories, and nutrient levels. Watch for hidden calories.
- Drink fewer calories in the form of sugar-sweetened beverages such as soda, fruit drinks, sports drinks, alcohol, and specialty coffees and teas.
- For problem foods, try eating small amounts under controlled conditions. Go out for a scoop of ice cream, for example, rather than buying half a gallon for your freezer.

Planning and Serving

- Keep a log of what you eat. Individuals who keep a log are more successful in weight loss programs.
- Eat regular meals and snacks daily, *including breakfast*, to distribute calories throughout your day.
- Consume the majority of your daily calories during the day, not in the evening.
- Pay special attention to portion sizes. Use measuring cups and spoons and a food scale until you become familiar with appropriate portion sizes.
- When you eat, just eat—don't do anything else, such as reading, using the computer, or watching TV.
- Avoid late-night eating—a behavior specifically associated with weight gain among college students.
- Eat slowly and stop before you are stuffed. It takes time for your brain to get the message that your stomach is full. Take small bites and chew food thoroughly and enjoy your food.

Special Occasions

- When you eat out, choose a restaurant where you can make healthy food choices. If portion sizes are large, take half your food home for a meal later in the week.
- Focus on the occasion and the people, not the food.
- If you cook a large meal for friends, send leftovers home with your guests or freeze them for later.

Physical Activity and Stress Management

- Increase your level of daily physical activity.
- Begin a formal exercise program that includes cardiorespiratory endurance exercise, strength training, and stretching.
- Develop techniques for handling stress that don't involve food. (See Chapter 2 for more about stress management.)
- Develop strategies for coping with nonhunger cues to eat, such as boredom, sleepiness, or anxiety. Try calling a friend, taking a shower, or going for a short walk.
- Tell family members and friends that you're changing your eating and exercise habits. Ask them to be supportive.

For more tips, visit the Let's Move website (www.letsmove.gov).



Coping Strategies

Appropriate coping strategies help you deal with the stresses of life; they are also an important lifestyle factor in weight management. Many people use eating as a way to cope; others may cope by turning to drugs, alcohol, smoking, or gambling. Those who overeat might use food to alleviate loneliness or to serve as a pickup for fatigue, as an antidote to boredom, or as a distraction from problems. Some people even overeat to punish themselves for real or imagined transgressions.

Those who recognize that they are misusing food in such ways can analyze their eating habits with fresh eyes. They can consciously attempt to find new coping strategies and begin to use food appropriately—to fuel life's activities, to foster growth, and to bring pleasure, but *not* as a way to manage stress. For a summary of the components of weight management through healthy lifestyle choices, see the box “Lifestyle Strategies for Successful Weight Management.”

APPROACHES TO OVERCOMING A WEIGHT PROBLEM

Americans spend approximately \$62 billion on weight loss efforts every year, including diet plans, diet products, and health club memberships. If you are overweight, you may already be creating a plan to lose weight and keep it off. You have many options.

Doing It Yourself

If you need to lose weight, focus on adopting the healthy lifestyle described throughout this book. The right weight for you will naturally evolve, and you won't have to diet. Combine modest cuts in energy intake with exercise, and avoid very low-calorie diets. (In general, a low-calorie diet should provide 1200–1500 calories per day.) By producing a negative energy balance of 250–1000 calories per day, you will produce the recommended weight loss of 0.5–2.0 pounds per week.

Don't try to lose weight more rapidly. Most low-calorie diets cause a rapid loss of body water at first. When this phase passes, weight loss declines. As a result, dieters are often misled into believing that their efforts are not working. They then give up, not realizing that smaller, mostly fat, losses later in the diet are actually better than the initial larger, mostly fluid losses. Reasonable weight loss is 8–10% of body weight over six months.

For many Americans, maintaining weight loss is a bigger challenge than losing weight. Most weight lost during a period of dieting is regained. When planning a weight management program, it is extremely important to include strategies that you can maintain over the long term, both for food choices and for physical activity. Weight management is a lifelong project. A registered dietitian or nutritionist can recommend an appropriate plan for you when you want to lose weight on your own. For more tips, refer to the "Behavior Change Strategy" section at the end of the chapter.

Diet Books

Many people who try to lose weight by themselves fall prey to one or more of the dozens of diet books on the market. Although some contain useful advice and motivational tips, most make empty promises. Accept books that advocate a balanced approach to diet plus exercise and sound nutritional advice, but reject any book that

- Advocates an unbalanced way of eating, such as a high-carbohydrate-only diet or a low-carbohydrate, high-protein diet, or that promotes a single food, such as cabbage or grapefruit.
- Claims to be based on a "scientific breakthrough" or to have the "secret to success."

- Uses gimmicks, such as matching eating to blood type, hyping insulin resistance as the single cause of obesity, or combining foods in special ways to achieve weight loss.
- Promises quick weight loss or limits food choices.

Many diets can cause weight loss if the diet is maintained; however, the real difficulty is finding a safe and healthy pattern of food choices and physical activity that results in long-term maintenance of a healthy body weight and reduced risk of chronic disease (see the box "Is Any Diet Best for Weight Loss?").

Dietary Supplements and Diet Aids

The number of dietary supplements and other weight loss aids on the market has also increased in recent years. Promoted in advertisements, magazines, direct mail campaigns, infomercials, and websites, these products typically promise a quick and easy path to weight loss. Most of these products are marketed as dietary

supplements and so are subject to fewer regulations than over-the-counter (OTC) medications. According to the Federal Trade Commission, more than half of advertisements for weight loss products make representations that were likely to be false. And although the FTC will order companies to stop making baseless and bogus product claims when monitors become aware of them, consumers are urged to critically evaluate any product that sounds too good to be true.

The following sections describe some commonly marketed OTC products for weight loss.

QUICK STATS

A 16-ounce whole-milk latte has 265 calories; beverages have a huge impact on calorie intake.

—CDC, 2011

Formula Drinks and Food Bars Canned diet drinks, powders used to make shakes, and diet food bars and snacks are designed to achieve weight loss by substituting for some or all of a person's daily food intake. However, most people find it difficult to use these products for long periods, and muscle loss and other serious health problems may result if they are used as the sole source of nutrition for an extended period. Use of such products sometimes results in rapid short-term weight loss, but the weight is typically regained because users don't learn to change their eating and lifestyle behaviors.

Herbal Supplements Most herbal weight loss products work by increasing urination (causing water loss); by stimulating the central nervous system (causing the body's activities to speed up or increasing metabolism); or by affecting levels of brain chemicals (causing appetite suppression). As described in Chapter 12, herbs are marketed as dietary supplements, so there is little information about effectiveness, proper dosage, drug interactions, or side effects. In addition, labels may not accurately reflect the ingredients and dosages present, and safe manufacturing practices are not guaranteed. Weight loss occurs only while the product is being taken.



CRITICAL CONSUMER

Is Any Diet Best for Weight Loss?

Many popular weight loss plans promote specific food choices and macronutrient combinations. Research findings have been mixed, but two points are clear: total calorie intake matters, and the best diet is probably the one you can stick with.

Low-Carbohydrate Diets

Some low-carb diets advocate fewer than 10% of total calories from carbohydrates, compared to the 45–65% recommended by the Food and Nutrition Board. Some suggest daily carbohydrate intake below the 130 grams needed to provide essential carbohydrates in the diet. Low-carb diets that advocate switching to “healthy carbs” are better for you than the more extreme versions.

Low-Fat Diets

Many experts advocate diets that are relatively low in fat, high in carbohydrates, and moderate in protein. If you try a low-fat diet, high-carb diet, you still need to pay attention to the quality of the carbohydrates you consume, focusing on whole grains, and your total calorie intake. A low-fat diet is not a license to consume excess calories, even in low-fat foods.

High-Protein Diets

High-protein diets advocate high protein intake, moderate fat intake, and low carbohydrate intakes. These diets can be low in fiber, whole grains, vegetables, and fruits and so may lack some essential nutrients. Diets high in protein and saturated fat have been linked to an increased risk of heart disease, high blood pressure, and cancer. One study found that following a diet with a normal protein-to-carbohydrate ratio (1 gram of protein to 2 grams of carbohydrate) promoted more improvements in body fat, waist circumference, and waist-to-hip ratio than following either a low-protein diet (1 gram of protein to 4 grams of carbohydrate) or a high-protein diet (1 gram of protein to 1 gram of carbohydrate) and was probably superior in reducing long-term chronic disease risk.

How Do Different Diets Measure Up?

A study comparing weight loss among adults assigned to one of four reduced-calorie diets differing in percentages of

protein, carbohydrate, and fat found that weight loss at two years was similar for all four diets (about 9 pounds). Weight loss was strongly associated with attendance at group sessions. Other studies have also found little difference in weight loss among popular reduced-calorie diets; most resulted in modest weight loss and reduced heart disease risk factors. The more closely people adhered to each diet, the more weight they lost.

Adding exercise helps people lose weight and improve disease risk factors. A study found that when overweight and obese people added exercise and weight loss to the DASH Eating Plan, they experienced greater reductions in blood pressure and greater improvements in insulin sensitivity and lipid levels than those who follow the DASH diet alone or regular diet plans.

Energy Balance Counts: The National Weight Control Registry

Future research may determine that certain macronutrient patterns are somewhat more helpful for disease reduction in people with particular risk profiles. In terms of weight loss, however, such differences among diets are likely overshadowed by the importance of total calorie intake and physical activity. Important lessons about energy balance can be drawn from the National Weight Control Registry—an ongoing study of people who have lost significant amounts of weight and kept it off. The average participant in the registry has lost 71 pounds and kept the weight off for more than five years. Nearly all participants use a combination of diet and exercise to manage their weight. This study illustrates that to lose weight and keep it off, you must decrease daily calorie intake and/or increase daily physical activity—and continue to do so over your lifetime.

SOURCES: Campbell, D. D., and K. A. Meckling. 2012. Effect of the protein: carbohydrate ratio in hypenergetic diets on metabolic syndrome risk factors in exercising overweight and obese women. *British Journal of Nutrition*, Jan 16: 1–14; Sacks, F. M., et al. 2009. Comparison of weight loss diets with different compositions of fat, protein, and carbohydrates. *The New England Journal of Medicine* 360: 859–873; Blumenthal, J. A., et al. 2010. Effects of the dietary approaches to stop hypertension diet alone and in combination with exercise and caloric restriction on insulin sensitivity and lipids. *Hypertension* 55(5): 1199–1205; Hill, J., and R. Wing. 2003. The National Weight Control Registry. *Permanente Journal* 7(3): 34–37.



The FDA has banned the sale of ephedra (*ma huang* in Chinese medicine), stating that it presented a significant and unreasonable risk to human health. Ephedrine, the active ingredient in ephedra, is structurally similar to amphetamine and was widely used in weight loss supplements. It may suppress appetite, but adverse effects have included elevated blood pressure, panic attacks, seizures, insomnia, and increased risk of heart attack or stroke, particularly when combined

with another stimulant such as caffeine. The FDA banned the synthetic stimulant phenylpropanolamine for similar reasons. Other herbal stimulants still on the market are described in Table 14.4.

Other Supplements Fiber is another common ingredient in OTC diet aids, promoted for appetite control. Many diet aids contain only 3 or fewer grams of fiber, which does

Table 14.4**Ingredients Commonly Found in Weight Loss Products**

COMMON NAME	USE/CLAIM	EVIDENCE/EFFICACY	SAFETY ISSUES
Bitter orange extract (<i>Citrus aurantium</i>)	CNS stimulant	Limited evidence	Highly concentrated extracts may increase blood pressure; should not be used by people with cardiac problems
Caffeine	CNS stimulant; increases fat metabolism	Amplifies effects of ephedra	Generally considered safe; caution advised in caffeine-sensitive individuals
<i>Garcinia cambogia</i>	May interfere with fat metabolism or suppress appetite	Inconclusive evidence	Short-term use (<12 weeks) generally considered safe when used as directed
Green tea extract	Diuretic; increases metabolism	Limited evidence	Generally considered safe
Guarana	CNS stimulant; diuretic	Few clinical trials	Same as for caffeine; overdose can cause painful urination, abdominal spasms, and vomiting
Senna, cascara, aloe, buckthorn berries	Stimulant, laxative	Not effective for weight loss	Chronic use decreases muscle tone in large intestine, causes electrolyte imbalances, and leads to dependence on laxatives
Tea, kola, dandelion, bucho, uva-ursi, damiana, juniper	Diuretic	Not effective for weight loss	Chronic use can cause possible electrolyte imbalance in some people
Yerba mate	Stimulant, laxative, diuretic	Limited evidence	Long-term use as a beverage may increase risk of oral cancer

SOURCES: WebMD 2011. *Over-the-Counter and Herbal Remedies for Weight Loss* (<http://www.webmd.com/diet/guide/herbal-remedies>); Leslie, K. K. 2003. Herbal weight loss products: effective and appropriate? *Today's Dietitian* 5(8).

not contribute much toward the recommended daily intake of 25–38 grams. Other popular dietary supplements include conjugated linoleic acid, carnitine, chromium, pyruvate, calcium, B vitamins, chitosan, and a number of products labeled “fat absorbers,” “fat blockers,” and “starch blockers.” Research has not found these products to be effective, and many have potentially adverse side effects.

Weight Loss Programs

Weight loss programs come in a variety of types, including noncommercial support organizations, commercial programs, websites, and clinical programs. All weight loss programs should encourage healthy behaviors that help you lose weight and that you can stick with every day. According to the NIH, safe and effective weight loss programs should include

- Healthy eating plans that reduce calories but do not exclude specific foods or food groups.
- Tips on ways to increase moderate-intensity physical activity.
- Tips on healthy habits that also keep your cultural needs in mind, such as lower-fat versions of your favorite foods.
- Slow and steady weight loss. Depending on your starting weight, experts recommend losing weight at a rate of $\frac{1}{2}$ to 2 pounds per week.

- A recommendation for medical evaluation and care if you have health problems, are taking medication, or are planning to follow a special formula diet that requires monitoring by a doctor.
- A plan to keep the weight off after you have lost it.

Noncommercial Weight Loss Programs Noncommercial programs such as TOPS (Take Off Pounds Sensibly) and Overeaters Anonymous (OA) mainly provide group support. They do not advocate any particular diet but do recommend seeking professional advice for creating an individualized plan. Like Alcoholics Anonymous, OA is a 12-step program with a spiritual orientation that promotes abstinence from compulsive overeating. These types of programs are generally free. Your physician or a registered dietitian can also provide information and support for weight loss.

Commercial Weight Loss Programs Commercial weight loss programs typically provide group support, nutrition education, physical activity recommendations, and behavior modification advice. Some also make available packaged foods to assist in following dietary advice.

In addition to the features of a safe and effective program outlined earlier, commercial weight loss programs should provide information about all fees and costs, including those of supplements and prepackaged foods, as



Weight Watchers is one of the best-known commercial weight loss programs. Actor Jennifer Hudson lost 80 pounds and became a spokesperson for the program.

well as data on risks and expected outcomes of participating in the program. They should also have a registered dietitian on staff along with qualified counselors and health professionals.

A strong commitment and a plan for maintenance are especially important because only about 10–15% of program participants maintain their weight loss—the rest gain back all or more than they had lost. One study found that important predictors of weight loss and maintenance of weight loss in commercial programs include an increased intake of vegetables, fruit, and low-fat dairy products; decreased intake of sweets; and regular exercise. A strong predictor of weight gain was frequent television viewing.

Online Weight Loss Programs Online diet websites have millions of subscribers worldwide. Most weight loss websites combine self-help with group support through chat rooms, bulletin boards, and e-newsletters. Many sites offer online self-assessment for diet and physical activity habits as well as a meal plan; some provide access to a staff professional for individualized help. Many are free, but some charge a weekly or monthly fee.

Research suggests that this type of program provides an alternative to in-person diet counseling and can lead to weight loss for some people. Studies found that people who logged onto Internet programs more frequently tended to lose more weight; weekly online contact proved most successful for weight loss. The criteria used to evaluate commercial programs can also be applied to Internet-based programs. In addition, make sure the program offers member-to-member support and access to staff professionals.

All prescription weight loss medications have potential side effects, ranging from diarrhea to elevated blood pressure.

Clinical Weight Loss Programs Medically supervised clinical programs are usually located in a hospital or other medical setting. Designed to help those who are severely obese, these programs typically involve a closely monitored very low-calorie diet. The cost of a clinical program is usually high, but insurance may cover part of the fee for those with obesity-related health problems.

Prescription Drugs

For a medicine to cause weight loss, it must reduce energy consumption, increase energy expenditure, and/or interfere with energy absorption. The medications most often prescribed for weight loss are appetite suppressants that reduce feelings of hunger or increase feelings of fullness. Appetite suppressants usually work by increasing levels of catecholamine or serotonin—two brain chemicals that affect mood and appetite.

All prescription weight loss drugs have potential side effects. Reported side effects include sleeplessness, nervousness, and euphoria, as well as increases in blood pressure and heart rate. Headaches, constipation or diarrhea, dry mouth, and insomnia are other side effects. If you are taking a prescription medication, discuss any concerns about side effects with your physician.

Most appetite suppressants are approved by the FDA only for short-term use. Some however, are approved for longer-term use, including sibutramine and orlistat (Xenical). Sibutramine's safety and efficacy record is good, but regular monitoring of blood pressure is required during therapy. Another type of weight loss drug works by blocking fat absorption in the intestines. Orlistat (Xenical) prevents about 30% of the fat in food from being digested. Similar to the fat substitute olestra, orlistat reduces the absorption of fat-soluble vitamins and antioxidants. Therefore, taking a vitamin supplement is highly recommended for people taking orlistat. Side effects include diarrhea, cramping, and other gastrointestinal problems if users do not follow a low-fat diet. Alli is an FDA-approved, lower-dose version of orlistat that is sold over the counter.

These medications work best in conjunction with behavior modification. Studies have generally found that appetite suppressants produce modest weight loss—about 5–22 pounds above the loss expected with nondrug obesity treatments. Individuals respond very differently, however, and some experience more weight loss than others. Unfortunately weight loss tends to level off or reverse after 4–6 months on a medication, and many people regain the weight they've lost when they stop taking the drug.

Prescription weight loss drugs are not for people who want to lose only a few pounds. The latest federal guidelines advise people to try lifestyle modification for at least six months before trying drug therapy. Prescription

drugs are recommended only in certain cases: for people who have been unable to lose weight with nondrug options and who have a BMI over 30 (or over 27 if two or more additional risk factors such as diabetes and high blood pressure are present). For severely obese people who have been unable to lose weight by other methods, prescription drugs may provide a good option.

Surgery

It is estimated that 5.7% of adult Americans have a BMI greater than 40, qualifying them as extremely or “morbidly” obese. The number of severely obese people has nearly doubled in the last two decades. Extreme obesity is a serious medical condition that is often complicated by other health problems such as diabetes, heart disease, arthritis, and sleep disorders. Surgical intervention may be necessary as a treatment of last resort. According to the NIH, weight loss (bariatric) surgery is recommended for patients with a BMI greater than 40, or greater than 35 with obesity-related illnesses.

Due to the increasing prevalence of severe obesity, surgical treatment of obesity is growing worldwide. Obesity-related health conditions, as well as risk of premature death, generally improve after surgical weight loss. However, as with any surgery, gastric surgery is not without risks, including death. In the short term, the risks of gastric bypass surgery can include excessive bleeding, infection, reaction to anesthesia, blood clots, breathing problems, and leaks in the gastrointestinal system. Long-term complications can include bowel obstruction, diarrhea, nausea, vomiting, gallstones, and malnutrition. Bariatric surgery modifies the gastrointestinal tract by changing either the size of the stomach or how the intestine drains, thereby reducing food intake. Three common surgeries are the Roux-en-Y gastric bypass, the vertical sleeve gastrectomy, and the adjustable gastric banding procedure.

The Roux-en-Y gastric bypass surgery separates the stomach into two pouches. The smaller pouch is attached to the

small intestine, and the larger one is bypassed. The procedure restricts food intake and reduces calorie absorption.

The **vertical sleeve gastrectomy** surgery removes approximately 80–85% of the stomach, leaving a new, smaller stomach shaped like a banana or garden hose. Like the bypass surgery, the procedure restricts food intake and causes the person to feel full after eating a small amount of food.

In the **adjustable gastric banding** procedure, commonly called the *Lap-Band*, an adjustable band is placed around the stomach to create a smaller stomach pouch. The band, which is filled with saline solution and can be tightened or loosened by adding or removing saline, ties off a portion of the stomach, restricting food intake. Results from the Lap-Band procedure may not be as significant as results from bypass surgery, in which part of the digestive system is rerouted. However, the Lap-Band procedure is often considered safer because it is less invasive, and patients generally have fewer complications. In mildly to moderately obese (BMI 30–35) adults, gastric banding surgery has been found to be more effective in reducing weight and improving quality of life than nonsurgical methods.

Liposuction Another procedure, *liposuction*, has become popular for removing localized fat deposits beneath the skin. This cosmetic procedure does not improve health the way weight loss does and involves considerable pain and discomfort.

QUICK STATS

Most bariatric surgery patients can expect to lose 50% or more of their excess weight within two years of the procedure.

—Mayo Clinic, 2011

BODY IMAGE

As described earlier in the chapter, body image consists of perceptions, images, thoughts, attitudes, and emotions. Developing a positive body image is an important aspect of psychological wellness and an important component of successful weight management.

Severe Body Image Problems

Poor body image can cause significant psychological distress. A person can become preoccupied with a perceived defect in appearance, thereby damaging self-esteem and interfering with relationships. Adolescents and adults who have a negative body image are more likely to diet restrictively, eat compulsively, or develop some other form of disordered eating.

When one's dissatisfaction with his or her own body image becomes extreme, the condition is called *body dysmorphic disorder (BDD)*. BDD affects about 2% of Americans, males and females in equal numbers; BDD usually begins before age 18 but can begin in adulthood. Sufferers are overly

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Why do you think people continue to buy into fad diets and weight loss gimmicks, even though they are constantly reminded that the key to weight management is lifestyle change? Have you ever tried a fad diet or weight loss supplement? If so, what were your reasons for trying it? What were the results?

concerned with physical appearance, often focusing on slight flaws that are not obvious to others. Low self-esteem is common. Individuals with BDD may spend hours every day thinking about their flaws and looking at themselves in mirrors; they may desire and seek repeated cosmetic surgeries. BDD is related to obsessive-compulsive disorder and can lead to depression, social phobia, and suicide if left untreated. An individual with BDD needs to get professional evaluation and treatment. Medication and therapy can help people with BDD.

In some cases, body image may bear little resemblance to fact. A person suffering from the eating disorder anorexia nervosa typically has a severely distorted body image—she believes herself to be fat even when she has become emaciated (see the next section for more about anorexia). Distorted body image is also a hallmark of *muscle dysmorphia*, a disorder experienced by some bodybuilders and other active people who see themselves as small and out of shape despite being very muscular. Those who suffer from muscle dysmorphia may let obsessive exercise—particularly muscle-building exercise, such as weight training—interfere with their work and relationships. They may also use steroids and other potentially dangerous muscle-building drugs.

Acceptance and Change

There are limits to the changes that can be made to body weight and body shape, both of which are influenced by heredity. The changes that can and should be made are lifestyle changes, as described throughout this chapter.

Knowing when you've reached the limits of healthy change—and learning to accept those limits—is crucial for overall wellness. Women in particular tend to measure self-worth in terms of their appearance. When they don't measure up to an unrealistic cultural ideal, they see themselves as defective, and their self-esteem falls. The result can be negative body image, disordered eating, or even a diagnosable eating disorder. Women who view their bodies positively tend to be more intuitive eaters, relying on internal hunger and fullness cues to regulate what and how much they eat. They think more about how their bodies feel and function than how they appear to others.

Knowing when you've reached the limits of healthy change, and accepting those limits, are crucial for overall wellness.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Describe your own body image in the fewest words possible. What satisfies you most and least about your body? Do you think your self-image is in line with the way others see you?



A balanced, realistic attitude toward weight management is part of overall wellness. Many healthy people do not fit society's image of ideal body size and shape.

Weight management needs to take place in a positive and realistic atmosphere. For an obese person, losing as few as 10 pounds can improve blood glucose control, reduce blood pressure and improve mood. The hazards of excessive dieting and overconcern about body weight need to be countered by a change in attitude. A reasonable weight must take into account a person's weight history, social circumstances, metabolic profile, and psychological well-being.

EATING DISORDERS

Problems with body weight and weight control are not limited to excessive body fat. A growing number of people, especially adolescent girls and young women, experience **eating disorders**—psychological disorders characterized by severe disturbances in body image, eating patterns, and eating-related behaviors. The major eating disorders are anorexia nervosa, bulimia nervosa, and binge-eating disorder. In the United States, almost 10 million females and 1 million males suffer from anorexia and bulimia, and millions more suffer from binge eating disorder. Many more people have abnormal eating habits and attitudes about food that disrupt their lives, even though these habits do not meet the criteria for a major eating disorder.

Many factors are probably involved in the development of an eating disorder. Although widely differing explanations

eating disorder A serious disturbance in eating patterns or eating-related behavior, characterized by a negative body image and concerns about body weight or body fat.

TERMS

have been proposed, they share one central feature: a dissatisfaction with body image and body weight. Such dissatisfaction is created by distorted thinking, including perfectionistic beliefs, unreasonable demands for self-control, and excessive self-criticism. Dissatisfaction with body weight leads to dysfunctional attitudes about eating, such as fear of fat and preoccupation with food, and problematic eating behaviors, including excessive dieting, constant calorie counting, and frequent weighing.

Heredity and the interaction of genes with environment appear to play an important role in the development of eating disorders. But as with other conditions, only the tendency to develop an eating disorder is explained by heredity; the expression of this tendency is affected by other factors. The home environment is one factor: families in which there is hostility, abuse, or lack of cohesion provide fertile ground for the development of an eating disorder. A rigid or over-protective parent can also increase the risk. Cultural messages, as well as family, friends, and peers, shape attitudes toward the self and others. Comparing oneself negatively with others can damage self-esteem and increase vulnerability. Young people who see themselves as lacking control over their lives are also at high risk for eating disorders. About 90% of eating disorders begin during adolescence. In recent years, however, cases of eating disorders have increased among children as young as 8.

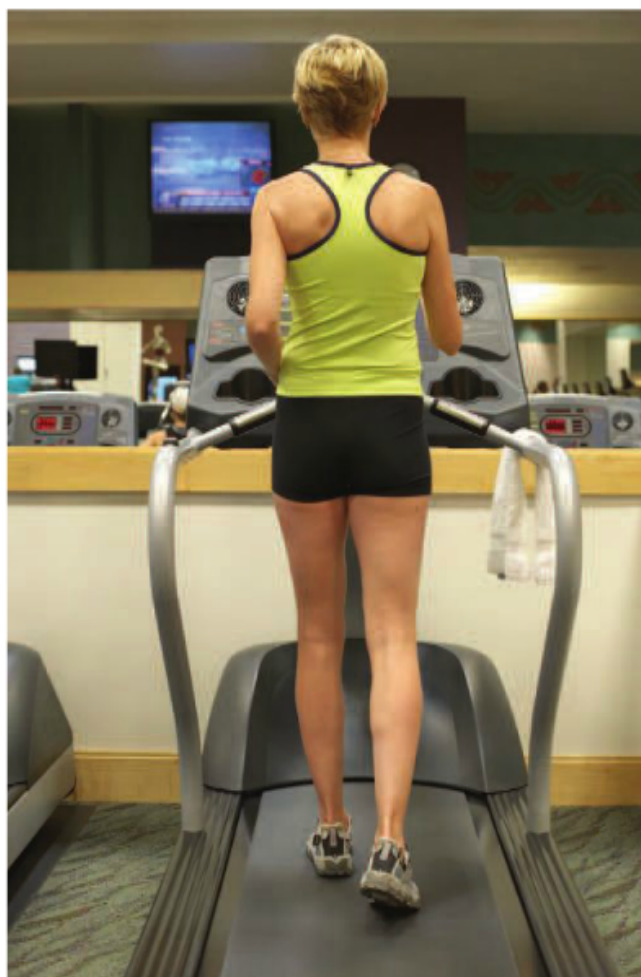
Certain turning points in life, such as leaving home for college, often trigger an eating disorder. How a person copes with such stresses can influence risk, particularly in individuals who have few stress management skills. An eating disorder may become a means of coping: the abnormal eating behavior reduces anxiety by producing numbness and alleviating emotional pain. Restrictive dieting is another possible trigger for the development of eating disorders.

Anorexia Nervosa

A person with **anorexia nervosa** does not eat enough food to maintain a reasonable body weight. Anorexia affects 0.6% of Americans, only one-third of whom are receiving treatment. Although it can occur earlier or later, anorexia typically develops during puberty and the late teenage years, with an average age of onset of about 19 years.

Characteristics of Anorexia Nervosa People with anorexia have an intense fear of gaining weight or becoming fat. Their body image is so distorted that even when emaciated they think they are fat. People with anorexia may engage in compulsive behaviors or rituals that help keep them from eating, though some may also binge and **purge**. They often use vigorous and prolonged exercise to reduce body weight as well. Although they may express a great interest in food, even taking over the cooking responsibilities for the rest of the family, their own diet becomes more and more restricted. People with anorexia often hide or hoard food without eating it.

People with anorexia are typically introverted, emotionally reserved, and socially insecure. They are often model



Exercise is a healthy practice, but people with eating disorders sometimes exercise compulsively, building their lives around their workouts. Compulsive exercise can lead to injuries, low body fat, and other health problems.

children who rarely complain and are anxious to please others and win their approval. Although school performance is typically above average, they are often critical of themselves and not satisfied with their accomplishments. For people with anorexia nervosa, their entire sense of self-esteem may be tied up in their evaluation of their body shape and weight.

Health Risks of Anorexia Nervosa Because of extreme weight loss, females with anorexia often stop menstruating,

anorexia nervosa An eating disorder characterized by a refusal to maintain body weight at a minimally healthy level and an intense fear of gaining weight or becoming fat; self-starvation.

TERMS

purging The use of vomiting, laxatives, excessive exercise, restrictive dieting, enemas, diuretics, or diet pills to compensate for food that has been eaten and that the person fears will produce weight gain.

become intolerant of cold, and develop low blood pressure and heart rate. They develop dry skin that is often covered by fine body hair like that of a newborn. Their hands and feet may swell and take on a blue tinge.

Anorexia nervosa has been linked to a variety of medical complications, including disorders of the cardiovascular, gastrointestinal, endocrine, and skeletal systems. When body fat is virtually gone and muscles are severely wasted, the body turns to its own organs in a desperate search for protein. Death can occur from heart failure caused by electrolyte imbalances. About 1 in 10 women with anorexia dies of starvation, cardiac arrest, or other medical complications—the highest death rate for any psychiatric disorder. Depression is also a serious risk: about half the fatalities related to anorexia are suicides.

Bulimia Nervosa

A person suffering from **bulimia nervosa** engages in recurrent episodes of binge eating followed by purging. Bulimia is often difficult to recognize because sufferers conceal their eating habits and usually maintain a normal weight, although they may experience weight fluctuations of 10–15 pounds. Although bulimia usually begins in adolescence or young adulthood, it has begun to emerge at increasingly younger (11–12 years) and older (40–60 years) ages; the average age of onset is about 20 years.

Characteristics of Bulimia Nervosa During a binge, a bulimic person may rapidly consume thousands of calories. This is followed by an attempt to get rid of the food by purging, usually by vomiting or using laxatives or diuretics. During a binge, bulimics feel as though they have lost control and cannot stop or limit how much they eat. Some binge and purge only occasionally; others do so many times every day.

People with bulimia may appear to eat normally, but they are rarely comfortable around food. Binges usually occur in secret and can become nightmarish—uncontrollably raiding the kitchen for food, going from one grocery store to another to buy food, or stealing food. During the binge, food acts as an anesthetic, blocking out feelings. Afterward, bulimics feel physically drained and emotionally spent. They usually feel deeply ashamed and disgusted with both themselves and their behavior and terrified that they will gain weight from the binge.

Major life changes such as leaving for college, getting married, having a baby, or losing a job can trigger a binge-purge cycle. At such times, stress is high and the person may have no

good outlet for emotional conflict or tension. As with anorexia, bulimia sufferers are often insecure and depend on others for approval and self-esteem. They may hide difficult emotions such as anger and disappointment from themselves and others. Binge eating and purging become a way of dealing with feelings.

Health Risks of Bulimia Nervosa The binge-purge cycle of bulimia places a tremendous strain on the body and can have serious health effects. Contact with vomited stomach acids erodes tooth enamel. Bulimic people often develop tooth decay because they binge on foods that are high in simple sugars. Repeated vomiting or the use of laxatives, in combination with deficient calorie intake, can damage the liver and kidneys and cause cardiac arrhythmia. Chronic hoarseness and esophageal tearing with bleeding may also result from vomiting. More rarely, binge eating can lead to rupture of the stomach. Although many bulimic women maintain normal weight, even a small weight loss to lower-than-normal weight can cause menstrual problems. And although less often associated with suicide or premature death than anorexia, bulimia is associated with increased depression, excessive preoccupation with food and body image, and sometimes disturbances in cognitive functioning.

Binge-Eating Disorder

Binge-eating disorder (BED) affects almost 3% of American adults. It is characterized by uncontrollable eating, usually followed by feelings of guilt and shame about weight gain. Common eating patterns are eating more rapidly than normal, eating until uncomfortably full, eating when not hungry, and preferring to eat alone. Binge eaters may eat large amounts of food throughout the day, with no planned mealtimes. Many people with binge-eating disorder mistakenly see rigid dieting as the only solution to their problem. However, rigid dieting usually causes feelings of deprivation and a return to overeating.

Compulsive overeaters rarely eat because of hunger. Instead food is used as a means of coping with stress, conflict, and other difficult emotions or to provide solace and entertainment. People who do not have the resources to deal effectively with stress may be more vulnerable to binge-eating disorder. Inappropriate overeating often begins during childhood. In some families, eating may be used as an activity to fill otherwise empty time. Parents may reward children with food for good

bulimia nervosa An eating disorder characterized by recurrent episodes of binge eating and purging—overeating and then using compensatory behaviors such as vomiting, laxatives, and excessive exercise to prevent weight gain.

binge-eating disorder An eating disorder characterized by binge eating and a lack of control over eating behavior in general.

TERMS

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know someone you suspect may suffer from an eating disorder? Does the advice in this chapter seem helpful to you? Do you think you could follow it? Why or why not? Have you ever experienced disordered eating patterns yourself? If so, can you identify the reasons for them?

Treatment of eating disorders usually involves a combination of psychotherapy and medical management. The therapy may be done individually or in a group; sessions involving the entire family may be recommended. A support or self-help group can be a useful adjunct to such treatment. Medical professionals, including physicians, dentists, gynecologists, and registered dietitians, can evaluate and manage the physical damage caused by the disorder. If a patient is severely depressed or emaciated, hospitalization may be necessary.

connect™

Connect to Your Choices

Have you ever thought about how you came to have the body weight and body composition you have? Many factors can influence our weight management choices, some not as obvious as others. Do you have easy access to high-calorie, high-fat snacks in your dorm or dining hall? Does your school provide transportation around campus, making it less appealing to walk to class? Does your TV or computer lure you into hours of sedentary entertainment?

What are the external factors that influence your choices about weight management? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

Many approaches work, but the simplest formula for weight management is moderate food intake coupled with regular exercise.

RIGHT NOW YOU CAN:

- Assess your weight management needs. Do you need to gain weight, lose weight, or stay at your current weight?
- List five things you can do to add more physical activity (not exercise) to your daily routine.
- Identify the foods you regularly eat that may be sabotaging your ability to manage your weight.

IN THE FUTURE YOU CAN:

- Make an honest assessment of your current body image. Is it accurate and fair, or is it unduly negative and unhealthy? If your body image presents a problem, consider getting professional advice on how to view yourself realistically.
- Keep track of your energy needs to determine whether your energy balance equation is correct. Use this information as part of your long-term weight management efforts.

SUMMARY

- Body composition is the relative amounts of fat-free mass and fat in the body. *Overweight* and *obesity* refer to body weight or the percentage of body fat that exceeds what is associated with good health.
- The key to weight management is maintaining a balance of calories in (food) and calories out (resting metabolism, food digestion, and physical activity).
- Standards for assessing body weight and body composition include body mass index (BMI) and percent body fat.
- Too much or too little body fat is linked to health problems; the distribution of body fat can also be a significant risk factor for many kinds of health problems.
- An inaccurate or negative body image is common and can lead to psychological distress.
- Genetic factors help determine a person's weight, but the influence of heredity can be overcome with attention to lifestyle factors.
- Physiological factors involved in the regulation of body weight and body fat include metabolic rate, hormonal influences, and the size and number of fat cells.
- Nutritional guidelines for weight management include consuming a moderate number of calories; limiting portion sizes, energy density, and the intake of fat, simple sugars, refined carbohydrates, and protein to recommended levels; and developing an eating schedule and rules for food choices.
- Activity guidelines for weight management emphasize daily physical activity and regular sessions of cardiorespiratory endurance exercise and strength training.
- Weight management requires developing positive self-talk and self-esteem, realistic weight and body composition goals, and a repertoire of appropriate techniques for handling stress and other emotional and physical challenges.
- People can be successful at long-term weight loss on their own by combining diet and exercise.
- Diet books, OTC diet aids and supplements, and formal weight loss programs should be assessed for safety and efficacy.
- Professional help is needed in cases of severe obesity; medical treatments include prescription drugs, surgery, and psychological therapy.
- Dissatisfaction with weight and shape are common to all eating disorders. Anorexia nervosa is characterized by self-starvation, distorted body image, and an intense fear of gaining weight. Bulimia nervosa is characterized by recurrent episodes of uncontrolled binge eating and frequent purging. Binge-eating disorder involves binge eating without regular use of compensatory purging.

FOR MORE INFORMATION

BOOKS

American Heart Association. 2011. *American Heart Association No-Fad Diet, 2nd Edition: A Personal Plan for Healthy Weight Loss*. New York: Clarkson Potter. Provides guidelines for successful weight management.

Costin, C., and G. S. Grabb. 2011. *8 Keys to Recovery from an Eating Disorder: Effective Strategies from Therapeutic Practice and Personal Experience*. New York: Norton. A motivating description of the recovery process, written by two therapists who interweave their personal narratives with clinical strategies.

Dillon, E. 2009. *Issues That Concern You: Obesity*. New York: Greenhaven Press. A collection of perspectives on the causes of obesity, its management, and its impact on individuals and society.

Fulda, J. 2008. *Half-Assed: A Weight-Loss Memoir*. Berkeley, CA: Seal Press. A funny, inspiring memoir detailing how the author lost half her body weight, 186 pounds, while struggling with issues of identity, self-acceptance, and change.

Gaesser, G. A., and K. Kratina. 2006. *It's the Calories, Not the Carbs*. Victoria, BC: Trafford. Provides a detailed look at the facts behind successful weight loss by shunning fad diets and practicing sound energy balance.

Mayo Clinic. 2012. *Mayo Clinic's Essential Diabetes Book*, 2nd ed. Rochester, MN: Mayo Clinic. A user-friendly guide to diabetes.

Samuelson, D. A., and A. D. Salzborg. 2011. *The Weight Loss Surgery Workbook: Deciding on Bariatric Surgery, Preparing for the Procedure, and Changing Habits for Post-Surgery Success*. Oakland, CA: New Harbinger Publications. A step-by-step workbook that guides patients through the process of weight loss surgery; written by a psychologist and a physician.

ORGANIZATIONS, HOTLINES, AND WEBSITES

American Diabetes Association. Provides information, a free newsletter, and referrals to local support groups; the website includes an online diabetes risk assessment.

<http://www.diabetes.org>

Calorie Control Council. This site includes a variety of interactive calculators, including an Exercise Calculator that estimates the calories burned from various forms of physical activity.

<http://www.caloriecontrol.org>

Centers for Disease Control and Prevention: Obesity. The home page for accessing all the CDC's information about overweight and obesity, their health risks, statistics, and diet and exercise.

<http://www.cdc.gov/obesity/index.html>

FDA Center for Food Safety and Applied Nutrition: Dietary Supplements. Provides background facts and information on the current regulatory status of dietary supplements, including compounds marketed for weight loss.

<http://www.fda.gov/Food/DietarySupplements/default.htm>

National Heart, Lung, and Blood Institute (NHLBI): Aim for a Healthy Weight. Provides information and tips on diet and physical activity, as well as a BMI calculator.

http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK): Weight-Control Information Network. Provides information and referrals for problems related to obesity, weight control, and nutritional disorders.

<http://win.niddk.nih.gov>

RESOURCES FOR PEOPLE CONCERNED ABOUT EATING DISORDERS

Eating Disorder Referral and Information Center

<http://www.edreferral.com>

Eating Disorders Coalition for Research, Policy and Action

<http://www.something-fishy.org>

MedlinePlus: Eating Disorders

<http://www.nlm.nih.gov/medlineplus/eatingdisorders.html>

National Association of Anorexia Nervosa and Associated Eating Disorders

630-577-1330 (help line)

<http://www.anad.org>

National Eating Disorders Association

800-931-2237

<http://www.nationaleatingdisorders.org>

National Institute of Mental Health: Eating Disorders

<http://www.nimh.nih.gov/health/topics/eating-disorders/index.shtml>

See also the listings in Chapters 12 and 13.

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BEHAVIOR CHANGE STRATEGY

Creating a Personal Weight Management Plan

The behavior management plan described in Chapter 1 provides an excellent framework for a weight management program. Following are some suggestions about specific ways you can adapt that general plan to controlling your weight.

Motivation and Commitment

Make sure you are motivated and committed before you begin. Failure at weight loss is a frustrating experience that can make it more difficult to lose weight in the future. Think about why you want to lose weight. Make a list of your reasons for wanting to lose weight, and post it in a prominent place.

Setting Goals

Choose a reasonable weight you think you would like to reach over the long term, and be willing to renegotiate it as you get further along. Break down your long-term weight and behavioral goals into a series of short-term action-oriented goals.

Creating a Negative Energy Balance

When your weight is constant, you are burning approximately the same number of calories as you are taking in. To tip the energy balance toward weight loss, you must consume fewer calories, or burn more calories through physical activity, or both. To generate a negative energy balance, it's usually best to begin by increasing activity level rather than decreasing your calorie consumption.

Physical Activity

Consider how you can increase your energy output simply by increasing routine physical activity, such as walking or taking the stairs. (Chapter 13 lists activities that use about 150 calories.) If you are not already involved in a regular exercise routine aimed at increasing endurance and building or maintaining muscle mass, seek help from someone who is competent to help you plan and start an appropriate exercise routine. If you are already doing regular physical exercise, evaluate your program according to the guidelines in Chapter 13.

Diet and Eating Habits

If you can't generate a large enough negative energy balance solely by increasing



physical activity, you may want to supplement exercise with modest cuts in your calorie intake. Your goal is to make small changes in your diet that you can maintain for a lifetime. Focus on cutting your intake of saturated and trans fats and added sugars and on eating a variety of nutritious foods in moderation. Don't skip meals, fast, or go on a very low-calorie diet or a diet that is unbalanced.

Making changes in eating habits is another important strategy for weight management. Refer to the box "Lifestyle Strategies for Successful Weight Management" for suggestions.

Self-Monitoring

Keep a record of your weight and behavior change progress. Try keeping a record of everything you eat. Write down what you plan to eat, in what quantity, *before* you eat. You'll find that just having to record something that is not OK to eat is likely to stop you from eating it. Also, keep track of your daily activities and your formal exercise program so you can monitor increases in physical activity.

Putting Your Plan into Action

- Examine the environmental cues that trigger poor eating and exercise habits, and devise strategies for dealing

with them. Anticipate problem situations, and plan ways to handle them more effectively.

- Create new environmental cues that will support your new healthy behaviors. Move fruits and vegetables to the front of the refrigerator.
- Get others to help. Talk to friends and family members about what they can do to support your efforts. Find a buddy to join you in your exercise program.
- Give yourself lots of praise and rewards. Focus attention to your accomplishments and achievements and congratulate yourself. Plan special nonfood treats for yourself, such as a walk or a movie. Reward yourself often and for anything that counts toward success.
- If you slip, don't waste time on self-criticism. Think positively instead of getting into a cycle of guilt and self-blame.
- Don't get discouraged. Be aware that although weight loss is bound to slow down after the first loss of body fluid, the weight loss at this slower rate is more permanent than earlier, more dramatic, losses.
- Remember that weight management is a lifelong project. You need to adopt reasonable goals and strategies that you can maintain over the long term.

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Cardiovascular Health

LOOKING AHEAD...

After reading this chapter, you should be able to

- List the major components of the cardiovascular system and describe how blood is pumped and circulated throughout the body
- Describe the controllable and uncontrollable risk factors associated with cardiovascular disease
- Discuss the major forms of cardiovascular disease and how they develop
- List the steps you can take to lower your personal risk of developing cardiovascular disease

TEST YOUR KNOWLEDGE

1. Reducing the amount of cholesterol you eat is the most important dietary change you can make to improve your blood cholesterol levels.
True or false?
2. Women are about as likely to die of cardiovascular disease as they are to die of breast cancer.
True or false?
3. On average, how much earlier does heart disease develop in people who don't exercise regularly than in people who do?
 - a. 6 months
 - b. 2 years
 - c. 6 years
4. Healthy teenagers have no signs of cardiovascular disease.
True or false?
5. Which of the following foods would be a good choice for promoting heart health?
 - a. Whole grains
 - b. Salmon
 - c. Bananas

ANSWERS

1. **FALSE.** Limiting your intake of saturated and trans fats, which promote the production of cholesterol by the liver, is the key dietary change for improving blood cholesterol levels; dietary cholesterol has much less effect on blood cholesterol.
2. **FALSE.** Nearly 1 in 3 American women die of cardiovascular disease; about 1 in 30 die from breast cancer.
3. **C.** Both aerobic exercise and strength training significantly improve cardiovascular health.
4. **FALSE.** Autopsy studies of young trauma victims show that narrowing of the arteries that supply the heart with blood begins in adolescence in many people.
5. **ALL THREE.** Whole grains (such as whole wheat), foods with omega-3 fatty acids (salmon), and foods high in potassium and low in sodium (bananas) all improve cardiovascular health.

Cardiovascular disease (CVD) affects more than 81 million Americans and is the leading cause of death in the United States, claiming one life every 38 seconds—nearly 2300 Americans every day. Heart attacks and strokes are the number-one and number-three causes of death, respectively, making them the most common life-threatening manifestations of CVD. Though we typically think of CVD as affecting primarily men and older adults, heart attack is the number-one killer of American women, and over 18% of CVD-related deaths occur in people under age 65.

CVD results largely from our way of life. Too many Americans eat an unhealthy diet, are overweight and sedentary, smoke, manage stress ineffectively, have uncontrolled high blood pressure or high cholesterol level, and don't know the signs of CVD. Not all the risk factors for CVD

are controllable—for example, family history of CVD increases your risk. But many key risk factors can be treated or modified, and you can reduce your overall risk of developing CVD.

This chapter introduces the workings of the cardiovascular system, explains CVD and its risks, and shows you how to keep your heart healthy for life.

THE CARDIOVASCULAR SYSTEM

The **cardiovascular system** consists of the heart and blood vessels. Together they move blood throughout the body (see page T2-2 of the color transparency insert “Touring the Cardiorespiratory System”). When the lungs are included, the system is known as the *cardiorespiratory* or *cardiopulmonary system*.

The Heart

The heart is a four-chambered, fist-sized muscle located just beneath the sternum (breastbone). It pumps deoxygenated (oxygen-poor) blood to the lungs and delivers oxygenated (oxygen-rich) blood to the rest of the body.

Blood actually travels through two separate circulatory systems. The right side of the heart pumps blood to the lungs in what is called **pulmonary circulation**, and the left side pumps blood through the rest of the body in the **systemic circulation**. The path of blood flow through the heart and cardiorespiratory system is illustrated on page T2-3 of the color transparency insert “Touring the Cardiorespiratory System.” Refer to that illustration as you trace these steps:

1. Oxygen-poor blood travels through large vessels, the **venae cavae**, into the heart’s right upper chamber, the right **atrium**.
2. After the right atrium fills, it contracts and pumps blood into the heart’s right lower chamber, the right **ventricle**.
3. When the right ventricle is full, it contracts and pumps blood through the pulmonary artery into the lungs.

QUICK STATS

Approximately
47 percent
of adults aged
18 and over have
some form of **CVD**.

—CDC, 2012



Monitoring blood pressure is a key strategy for the prevention of CVD. Blood pressure can be measured by a health care professional during a health care visit or at home with a home blood pressure monitor.

4. In the lungs, blood picks up oxygen and discards carbon dioxide.
5. The oxygenated blood flows from the lungs through the pulmonary veins into the heart’s left atrium.
6. After the left atrium fills, it contracts and pumps blood into the left ventricle.
7. When the left ventricle is full, it pumps blood through the **aorta**—the body’s largest artery—for distribution to the rest of the body’s blood vessels.

Each heartbeat consists of two basic parts: diastole and systole. During **diastole**, the atria and ventricles relax and begin to fill with blood. At the end of diastole, the atria contract (atrial systole), which pumps blood into the ventricles. The atria then begin to relax. During **systole**, the ventricles contract (ventricular systole) to pump blood out of the heart.

Blood pressure, the force exerted by blood on the walls of the blood vessels, is created by the pumping action of the heart and the resistance of the blood vessels. This is an important concept because high blood pressure is treated by medicines that work on contraction as well as on the overall resistance of the blood vessels. Blood pressure is greater during systole than during diastole.

The heartbeat—the sequence of contractions of the heart’s four chambers—is controlled by nerve impulses. These signals originate in a bundle of specialized cells in the right

TERMS

cardiovascular disease (CVD) The collective term for various diseases of the heart and blood vessels.

cardiovascular system The system that circulates blood through the body; consists of the heart and blood vessels.

pulmonary circulation The part of the circulatory system controlled by the right side of the heart: the circulation of blood between the heart and the lungs.

systemic circulation The part of the circulatory system controlled by the left side of the heart: the circulation of blood between the heart and the rest of the body.

vena cava Either of two large veins through which blood is returned to the right atrium of the heart (plural, *venae cavae*).

atrium Either of the two upper chambers of the heart in which blood collects before passing to the ventricles (plural, *atria*).

ventricle Either of the two lower chambers of the heart that pump blood to the lungs and other parts of the body.

aorta The large artery that receives blood from the left ventricle and distributes it to the body.

diastole The relaxation phase of the heart.

systole The contraction phase of the heart.

blood pressure The force exerted by the blood on the walls of the blood vessels, created by the pumping of the heart and the resistance of the blood vessels.

atrium called the *sinoatrial node* or *pacemaker*. This pacemaker produces a steady heart rate that can be speeded up or slowed down by a number of factors, including the brain's response to stimuli such as stress or the tissues' need for more oxygen.

The Blood Vessels

Blood vessels are classified by size and function. **Veins** carry blood to the heart. **Arteries** carry blood away from the heart. Veins have thin walls, but arteries have thick elastic walls that enable them to expand and relax with the volume of blood being pumped through them.

After leaving the heart, the aorta branches into smaller and smaller vessels. The smallest arteries branch still further into **capillaries**—tiny vessels with walls only one cell thick. The capillaries deliver oxygen- and nutrient-rich blood to the tissues and pick up oxygen-poor, carbon dioxide-laden blood. From the capillaries, this blood empties into small veins (*venules*) and then into larger veins that return it to the heart to repeat the cycle.

Blood pumped through the heart does not reach the cells of the heart, so the organ has its own network of arteries, veins, and capillaries. Two large vessels, the right and left **coronary arteries**, branch off the aorta and supply the heart muscle with oxygenated blood. (The coronary arteries are shown on page T2-3 of the color transparency insert “Touring the Cardiorespiratory System.”) Blockage of a coronary artery is the leading cause of heart attacks.

RISK FACTORS FOR CARDIOVASCULAR DISEASE

Researchers have identified a variety of factors associated with an increased risk of developing CVD. They are grouped into two categories: major risk factors and contributing risk factors. Some risk factors are linked to controllable aspects of lifestyle and can therefore be changed. Others are beyond our control.

Major Risk Factors That Can Be Changed

The American Heart Association (AHA) has identified six major risk factors for CVD that can be changed: tobacco use, high blood pressure, unhealthy blood cholesterol levels, phys-

ical inactivity, overweight and obesity, and diabetes. Most Americans, including young adults, have at least one major risk factor for CVD.

Tobacco Use Nearly one in five deaths is attributable to smoking. In 2010 an estimated 19.3 percent of American adults smoked, including 20.1 percent of those aged 18–24. Smoking remains the number-one preventable cause of CVD in the United States. People who smoke a pack of cigarettes a day have twice the risk of heart attack as nonsmokers; smoking two or more packs a day triples the risk. When smokers have heart attacks, they are two to three times more likely than nonsmokers to die from them. Cigarette smoking also doubles the risk of stroke.

Smoking harms the cardiovascular system in the following ways:

- It damages the lining of arteries.
- It reduces the level of high-density lipoproteins (HDL), or “good” cholesterol.
- It raises the levels of triglycerides and low-density lipoproteins (LDL), or “bad” cholesterol.
- Nicotine increases blood pressure and heart rate.
- The carbon monoxide in cigarette smoke displaces oxygen in the blood, reducing the amount of oxygen available to the body.
- Smoking causes **platelets** to stick together in the bloodstream, leading to clotting.
- Smoking speeds the development of fatty deposits in the arteries.

You don't have to smoke to be affected. The risk of developing heart disease increases up to 30% among those exposed to environmental tobacco smoke (ETS) at home or at work. Researchers estimate that about 46,000 nonsmokers die from heart disease each year as a result of exposure to ETS. (See Chapter 11 for more information about smoking.)

High Blood Pressure High blood pressure, or **hypertension**, is a risk factor for many forms of cardiovascular disease, including heart attacks and strokes, and is itself the most prevalent form of CVD.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How often do you think about the health of your heart? Are there certain situations that make you aware of your heart rate, or make you wonder how strong your heart is?

TERMS

vein A vessel that carries blood to the heart.

artery A vessel that carries blood away from the heart.

capillary A small blood vessel that exchanges oxygen and nutrients between the blood and the tissues.

coronary artery One of the system of arteries branching from the aorta that provides blood to the heart muscle.

platelets Cells in the blood that are necessary for the formation of blood clots.

hypertension Sustained abnormally high blood pressure.



Smoking is a major risk factor for cardiovascular disease, doubling the risk for both heart attack and stroke.

Blood pressure, the force exerted by the blood on the vessel walls, is created by the pumping action of the heart and the resistance of the arteries. High blood pressure occurs when too much force is exerted against the walls of the arteries. Many factors affect blood pressure, such as exercise or excitement. Short periods of high blood pressure are normal, but chronic high blood pressure is a health risk.

Health care professionals measure blood pressure with a stethoscope and an instrument called a *sphygmomanometer*. At home you can track your own blood pressure by using an electronic blood pressure monitor. Blood pressure is expressed as two numbers—for example, 120 over 80—and measured in millimeters of mercury (mm Hg). The first number is the *systolic* blood pressure; the second is the *diastolic* blood pressure. A normal blood pressure reading for a healthy adult is below 120 systolic and below 80 diastolic, and CVD risk increases when blood pressure rises above that level. High blood pressure in adults is defined as equal to or greater than 140 over 90 (Table 15.1).

In about 90% of people with high blood pressure, the cause is unknown. This type of high blood pressure is called *primary* (or *essential*) *hypertension* and is probably due to a

mixture of genetic and environmental factors, including obesity, stress, excessive alcohol intake, inactivity, and a high-fat, high-salt diet. In the remaining 10% of people, the condition is caused by an underlying illness and is referred to as *secondary hypertension*.

CAUSES High blood pressure results from an increased output of blood by the heart or from increased resistance to blood flow in the arteries. The latter condition can be caused by constriction of smooth muscle surrounding the arteries or by **atherosclerosis**, a disease process that causes arteries to become clogged and narrowed. (Atherosclerosis is discussed in detail later in this chapter.) Atherosclerosis also scars and hardens arteries, making them less elastic and further increasing blood pressure. When a person has high blood pressure, the heart must work harder than normal to force blood through the narrowed and stiffened arteries, straining both the heart and the arteries. Eventually the strained heart weakens and tends to enlarge, which can weaken it even more.

HEALTH RISKS High blood pressure is often called a silent killer because it usually has no symptoms. A person may have high blood pressure for years without realizing it. But during that time, it damages vital organs and increases the risk of heart attack, congestive heart failure, stroke, kidney failure, and blindness.

Recent research has shed new light on the importance of lowering blood pressure to improve cardiovascular health. The risk of death from heart attack or stroke begin to rise when blood pressure is above 115 over 75, well below the traditional 140 over 90 cutoff for a diagnosis of hypertension. People with blood pressure in the prehypertension range are at increased risk of heart attack and stroke as well as at significant risk of developing full-blown hypertension.

PREVALENCE Hypertension is common. About 30% of adults have hypertension, and 37% have prehypertension (defined as systolic pressure of 120–139 and/or diastolic pressure of 80–89). The incidence of high blood pressure increases with age, but it can occur among children and young

adults, and women sometimes develop hypertension during pregnancy (blood pressure usually returns to normal following pregnancy). High blood pressure is two to three times more common in women taking oral contraceptives, especially in obese and older women; this risk increases with the duration of use. The rate of hypertension is highest in African Americans (41%). Among African Americans, compared with other groups, the disorder is often more

QUICK STATS

33% of Americans have high blood pressure; 20% of them aren't aware of their condition.

—CDC, 2010

atherosclerosis A form of CVD in which the inner layers of artery walls are made thick and irregular by plaque deposits; arteries become narrow, and blood supply is reduced.

TERMS

Table 15.1**Blood Pressure Classification for Healthy Adults**

CATEGORY ^a	SYSTOLIC (mm Hg)		DIASTOLIC (mm Hg)
Normal ^b	below 120	and	below 80
Prehypertension	120–139	or	80–89
Hypertension ^c			
Stage 1	140–159	or	90–99
Stage 2	160 and above	or	100 and above

^aWhen systolic and diastolic pressure fall into different categories, the higher category should be used to classify blood pressure status.

^bThe risk of death from heart attack and stroke begins to rise when blood pressure is above 115/75.

^cBased on the average of two or more readings taken at different physician visits. In people older than 50, systolic blood pressure greater than 140 is a much more significant CVD risk factor than diastolic blood pressure.

SOURCE: *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure*. 2003. Bethesda, MD: National Heart, Lung, and Blood Institute. National Institutes of Health (NIH Publication No. 03-5233).

severe, more resistant to treatment, and more likely to be fatal at an early age.

TREATMENT Primary hypertension cannot be cured, but it can be controlled. Because hypertension has no early warning signs, it's crucial to have your blood pressure tested at least once every two years (more often if you have other CVD risk factors). In fact, experts now advise that anyone with hypertension or prehypertension monitor their own blood pressure several times each week. Self-monitoring is easy to do with a low-cost digital home blood pressure monitor. It is also important to follow your physician's advice about lifestyle changes and medication.

Lifestyle changes are recommended for everyone with prehypertension and hypertension. These changes include weight reduction, regular exercise, a healthy diet, and moderation of alcohol use. The DASH diet (see Chapter 12) is recommended specifically for people with high blood pressure. It emphasizes fruits, vegetables, and whole grains and increasing potassium and fiber intake. Even small increases in fruit and vegetable intake can create measurable drops in blood pressure.

Sodium restriction is also helpful for most people with hypertension. The 2010 Dietary Guidelines for Americans recommend restricting sodium consumption to less than 2,300 mg per day and to less than 1500 mg per day for people with hypertension, African Americans, and middle-aged and older adults.

Both sodium and chloride, the two constituents of table salt, have been shown to increase the risk of hypertension. Over the short term, dietary salt restriction has relatively modest effects on blood pressure; but over the course of several decades, the reduction may be far more significant, in part because salt restriction minimizes the normal rise in blood pressure associated

with aging. In addition, certain groups appear to have more dramatic decreases in blood pressure as a result of salt restriction. These more salt-sensitive groups include older adults, African-Americans, obese individuals, people with metabolic syndrome, and those with chronic kidney disease. High dietary salt intake over many years probably plays a greater role in the development of hypertension in these groups.

Since approximately 80% of dietary salt in the American diet comes from the salt added in food and drink processing, the easiest way to achieve populationwide reduction is by lowering the amount of salt added by food processors. Reductions in supplemental salt in restaurant food have also been suggested.

A recent study demonstrated that reducing salt in the American diet would significantly reduce the number of new cases of coronary heart disease, stroke, and heart attack in the United States. The benefits of reduced salt intake were estimated to be similar to the benefits of populationwide reductions in tobacco use, obesity, and cholesterol levels.

Adequate potassium intake is also important. The recommended intake is 4.7 grams per day, which should be obtained through food. Supplements should be taken only when recommended by a physician because excessive levels of potassium can be lethal.

For people whose blood pressure isn't adequately controlled with lifestyle changes, medication is prescribed. Because many different types of antihypertensive drugs are available, physicians are usually able to find one that lowers blood pressure effectively with few side effects.

High Cholesterol Cholesterol is a fatty, waxlike substance that circulates through the bloodstream. It is an important component of cell membranes, sex hormones, vitamin D, the fluid that coats the lungs, and the protective sheaths around nerves. Adequate cholesterol is essential for the proper functioning of the body. Excess cholesterol, however, can clog arteries and increase the risk of CVD. There are two sources of cholesterol: your liver manufactures it, and you get it from the foods you eat.

GOOD VERSUS BAD CHOLESTEROL Cholesterol is carried in the blood in protein-and-lipid packages called **lipoproteins** (Figure 15.1). Two types of lipoproteins influence an individual's risk of heart disease:

- **Low-density lipoproteins (LDLs)** shuttle cholesterol from the liver to the organs and tissues that require it. LDL is known as "bad" cholesterol because if there is more than the

lipoproteins Protein-and-lipid substances in the blood that carry fats and cholesterol; classified according to size, density, and chemical composition.

TERMS

low-density lipoprotein (LDL) A lipoprotein containing a moderate amount of protein and a large amount of cholesterol, which tends to become deposited on artery walls and increase the risk of heart disease; "bad" cholesterol.

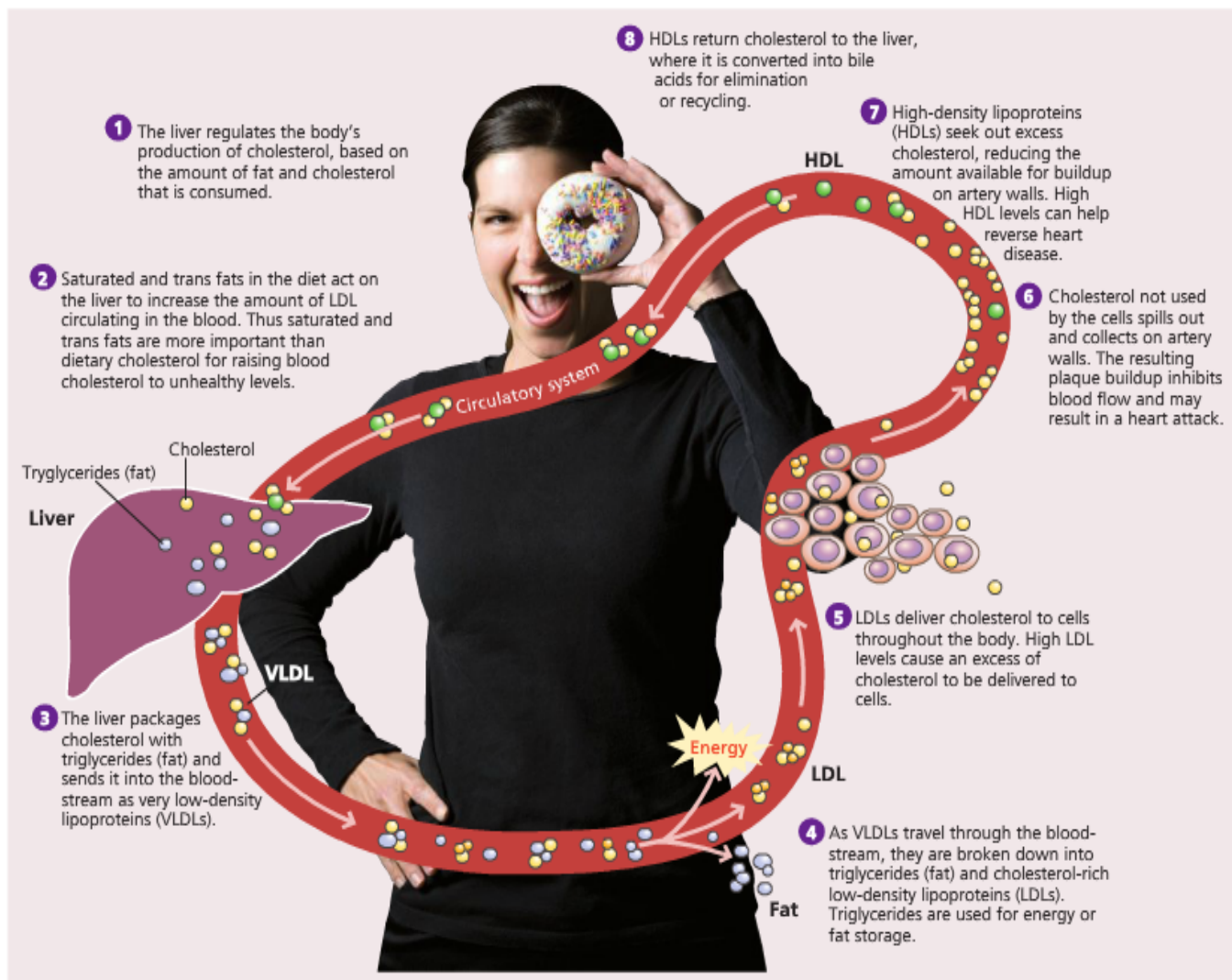


FIGURE 15.1 Cholesterol in the body.

body can use, the excess is deposited in the blood vessels. LDL that accumulates and becomes trapped in artery walls may be oxidized by free radicals, speeding inflammation and damage to artery walls and increasing the likelihood of a blockage. If coronary arteries are blocked, the result may be a heart attack; if an artery carrying blood to the brain is blocked, a stroke may occur.

- **High-density lipoproteins (HDLs)**, or “good” cholesterol, shuttle unused cholesterol back to the liver for recycling. By removing cholesterol from blood vessels, HDL helps protect against atherosclerosis.

high-density lipoprotein (HDL) A lipoprotein containing relatively little cholesterol that helps transport cholesterol out of the arteries and thus protects against heart diseases; “good” cholesterol.

TERMS

RECOMMENDED BLOOD CHOLESTEROL LEVELS The risk for cardiovascular disease increases with higher blood cholesterol levels, especially LDL (Table 15.2). The National Cholesterol Education Program (NCEP) recommends lipoprotein testing at least once every five years for all adults, beginning at age 20. The recommended test measures total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides (another blood fat). In general, high LDL, total cholesterol, and triglyceride levels, combined with low HDL levels, are associated with a higher risk for CVD. You can reduce this risk by lowering LDL, total cholesterol, and triglycerides. Raising HDL is important because a high HDL level seems to offer protection from CVD even in cases where total cholesterol is high. This appears to be especially true for women.

As shown in Table 15.2, LDL levels below 100 mg/dl (milligrams per deciliter) and total cholesterol levels below 200 mg/dl are desirable. An estimated 102 million American adults have total cholesterol levels of 200 mg/dl or higher

Table 15.2 Cholesterol Guidelines

TOTAL CHOLESTEROL (mg/dl)	
Less than 200	Desirable
200–239	Borderline high
240 or more	High
LDL CHOLESTEROL (mg/dl)	
Less than 100	Optimal
100–129	Near optimal/above optimal
130–159	Borderline high
160–189	High
190 or more	Very high
HDL CHOLESTEROL (mg/dl)	
Less than 40	Low (undesirable)
60 or more	High (desirable)
TRIGLYCERIDES (mg/dl)	
Less than 150	Normal
150–199	Borderline high
200–499	High
500 or more	Very high

SOURCE: Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. 2001. Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *Journal of the American Medical Association* 285(19).

(Table 15.3). Even though these tables define an optimal level, research now shows that levels of cholesterol as low as 60mg/dl have even better outcomes. Increasing data show that in certain populations, the lower the cholesterol levels, the better.

The CVD risk associated with elevated cholesterol levels also depends on other factors. For example, an above-optimal level of LDL would be of more concern for someone who also smokes and has high blood pressure than for someone without these additional CVD risk factors, and it is especially a concern for diabetics. For this reason, optimal levels (LDL <70mg/dl) for patients who have diabetes or have had a previous heart attack are much lower than those for people without these risk factors.

BENEFITS OF CONTROLLING CHOLESTEROL

People can cut their heart attack risk by about 2% for every 1% that they reduce their total blood cholesterol levels. People who lower their total cholesterol from 250 to 200 mg/dl, for example, reduce their risk of heart attack by 40%. Studies indicate that lowering LDL and raising HDL levels not only reduces the likelihood that arteries will become clogged but may also reverse deposits on artery walls.

Your primary goal should be to reduce your LDL to healthy levels. Important dietary changes for reducing LDL levels include increasing fiber intake and substituting unsat-

Exercise is thought to be the closest thing we have to a magic bullet against heart disease.

VITAL STATISTICS

Table 15.3 Prevalence of High Cholesterol in Adult Americans

	TOTAL CHOLESTEROL ≥ 200 mg/dl	TOTAL CHOLESTEROL ≥ 240 mg/dl
Both sexes	44.4%	15.0%
Males	41.8%	13.5%
Females	46.3%	16.2%
White males	41.2%	13.7%
White females	47.0%	16.9%
Black males	37.0%	9.7%
Black females	41.2%	13.3%
Mexican American males	50.1%	16.9%
Mexican American females	46.5%	14.0%

SOURCE: American Heart Association. 2012. *Heart Disease and Stroke Statistics, 2012 Update*. Dallas: American Heart Association.

urated for saturated and trans fats. Decreasing saturated and trans fats is particularly important because they promote the production of cholesterol by the liver. Exercising regularly and eating more fruits, vegetables, fish, and whole grains also help. Many experts believe that cholesterol-lowering foods may be most effective when eaten in combination, rather than separately. You can raise your HDL levels by exercising regularly, losing weight if you are overweight, quitting smoking, and altering the amount and type of fat you consume.

In recent years, a group of medications called statins have been shown to reduce total cholesterol levels and LDL. Statins dramatically reduce the risk of CVD in individuals with high cholesterol levels. These medications may also decrease CVD risk even in those without high cholesterol levels.

See Chapter 12 for detailed information about nutrition and guidelines for heart-healthy eating.

Physical Inactivity An estimated 40–60 million Americans are so sedentary that they are at high risk for developing CVD. Exercise is thought to be the closest thing we have to a magic bullet against heart disease. It lowers CVD risk by helping to decrease blood pressure and resting heart rate, increase HDL levels, maintain desirable weight, improve the condition of blood vessels, and prevent or control diabetes. One study found that women who accumulated at least three hours of brisk walking each week cut their risk of heart attack and stroke by more than 50%.

See Chapter 13 for detailed explanations of the benefits of physical activity and for help in creating your own exercise plan.

Obesity As your weight increases, your risk of CVD increases. Death from CVD is two to three times more likely in obese people (BMI ≥ 30) than it is in lean people (BMI 18.5–24.9), and for every 5-unit increase in BMI, a person's risk of death from coronary heart disease increases by 30%. BMI at age 18 predicts mortality due to CVD—the higher your BMI at age 18, the more likely you are to eventually die from CVD. Maintaining a healthy weight is also important. Researchers found that middle-aged women who had gained 22 pounds or more since age 18 had a significantly higher risk of subsequent death from CVD than those who maintained their weight over time.

As explained in Chapter 14, excess body fat is strongly associated with hypertension, high cholesterol levels, insulin resistance, diabetes, physical inactivity, and increasing age. It is also associated with endothelial cell dysfunction and increased inflammatory markers (discussed later in this chapter). **Endothelial cells** line the inside of arteries, including the coronary arteries, and they help regulate blood flow to the heart and keep platelets and other cells from sticking to artery walls. When the endothelial cells are healthy, the coronary arteries dilate (widen) when the heart needs more blood; but when the cells are dysfunctional, the coronary arteries instead constrict, limiting blood flow to the heart. With excess weight, there is also more blood to pump and the heart has to work harder. This causes chronically elevated pressures within the heart chambers that can lead to ventricular **hypertrophy** (enlargement). Eventually the heart muscle can start to fail.

Physical activity and fitness have a strong positive influence on cardiovascular health in those who are overweight and obese. People who are obese but have at least moderate cardiorespiratory fitness may have lower rates of cardiovascular disease than their normal-weight but unfit peers. For someone who is overweight, even modest weight

reduction—5–10% of body weight—can reduce CVD risk.

Diabetes As described in Chapter 14, *diabetes* is a disorder characterized by elevated blood glucose levels due to an insufficient supply or inadequate action of insulin. Diabetes doubles the risk of CVD for men and triples the risk for women. The most common cause of death in adults with diabetes is CVD, and they usually die at younger ages than people without diabetes. There is an estimated loss of 5–10 years of life in those with diabetes.

People with diabetes have higher rates of other CVD risk factors, including hypertension, obesity, and unhealthy blood lipid levels (typically, high triglyceride levels and low HDL levels). The elevated blood glucose and insulin levels that occur in diabetes can damage the endothelial cells that line the arteries, making them more vulnerable to atherosclerosis. Diabetics also often have platelet and blood coagulation abnormalities that increase the risk of heart attack and stroke. People with prediabetes also face a significantly increased risk of CVD.

The number of people with diabetes (25.8 million) and prediabetes (79 million) continues to climb and is closely linked to obesity. It is estimated that for every kilogram (2.2 pounds) increase in weight, the risk of diabetes increases by approximately 9%. The largest increase in prevalence of type 2 diabetes over the past decade has been among people aged 30–39, and there has also been an alarming increase among children and adolescents. Children who are diagnosed with diabetes typically develop complications in their twenties or thirties.

Complications of diabetes affect mainly the arteries. When the larger arteries are affected, all forms of CVD may result, including heart attacks, strokes, and peripheral vascular disease. Having diabetes is considered to be a heart disease risk equivalent, meaning that your CVD morbidity and mortality risk is the same as if you already had coronary artery disease (CAD). Diabetics who have CAD fare even worse: they have accelerated atherosclerosis and benefit less from common forms of treatment than nondiabetics.

Routine screening for diabetes is not currently recommended unless a person has symptoms of diabetes or other CVD risk factors. In people with prediabetes, a healthy diet and exercise are more effective than medication at preventing diabetes. For people with diabetes, a healthy diet, exercise, and careful control of glucose levels are recommended to reduce the chances of developing complications. Even people

QUICK STATS

65% of people with diabetes die from CVD.

—American Heart Association, 2012



Overweight and obesity are major risk factors for cardiovascular disease, but physical activity, including walking, can lower that risk. Modest weight loss can also reduce CVD risk.

endothelial cells Cells lining the inside of arteries.

hypertrophy Abnormal enlargement of an organ.

TERMS



Blood glucose monitoring is important in managing diabetes and its associated risks.

whose diabetes is under control face a high risk of CVD, so control of other risk factors is critical.

Contributing Risk Factors That Can Be Changed

Other CVD risk factors that can be changed include triglyceride levels and psychological and social factors.

High Triglyceride Levels Like cholesterol, **triglycerides** are blood fats that are obtained from food and manufactured by the body. High triglyceride levels are a reliable predictor of heart disease, especially if associated with other risk factors, such as low HDL levels, obesity, and diabetes. Factors contributing to elevated triglyceride levels include excess body fat, physical inactivity, cigarette smoking, type 2 diabetes, excessive alcohol intake, very high-carbohydrate diets, and certain diseases and medications.

Much of the picture regarding triglycerides remains unclear. Studies have yet to show whether lowering triglyceride levels will actually decrease heart disease. Elevated triglyceride levels are most often seen in people with other lipid abnormalities. Further, the lifestyle modifications that help lower cholesterol also help decrease triglycerides, making it

difficult to identify any potential independent benefit of lowering triglyceride levels.

A full lipid profile should include testing and evaluation of triglyceride levels (see Table 15.2). For people with borderline high triglyceride levels, increased physical activity, reduced intake of added sugars, and weight reduction can help bring levels down into the healthy range. For people with high triglyceride levels, drug therapy may be recommended. Being moderate in the use of alcohol and quitting smoking are also important.

Insulin Resistance and Metabolic Syndrome When you consume carbohydrates, your blood glucose level increases. This stimulates the pancreas to secrete insulin, which allows body cells to pick up glucose to use for energy (see Chapter 14). The function of insulin is to maintain proper glucose levels in the body, which it does by affecting the uptake of glucose from the blood by muscle and fat tissue and by limiting the liver's production of glucose. As people gain weight and become less active, their muscles, fat, and liver become less sensitive to the effect of insulin—a condition known as *insulin resistance* (or prediabetes). As the body becomes increasingly insulin resistant, the pancreas must secrete more and more insulin (hyperinsulinemia) to keep glucose levels within a normal range. Eventually even high levels of insulin may become insufficient, and blood glucose levels start to rise (hyperglycemia), resulting in type 2 diabetes.

Those who have insulin resistance tend to have several other related risk factors. This cluster of abnormalities is called *metabolic syndrome* or *insulin resistance syndrome* (Table 15.4). Metabolic syndrome significantly increases the risk of CVD—more so in women than in men. It is estimated that about 34% of the adult U.S. population has metabolic syndrome.

To reduce your risk of metabolic syndrome, choose a healthy diet and get plenty of exercise. Regular physical activity increases your body's sensitivity to insulin, improves cholesterol levels, and decreases blood pressure. Reducing calorie intake to prevent weight gain or losing weight if needed also reduces insulin resistance. The amount and type of carbohydrate intake is also important: diets high in simple carbohydrates, such as white sugar and white flour (high-glycemic-index foods) can raise levels of glucose and triglycerides while lowering HDL, thus contributing to metabolic syndrome and CVD. This is particularly true for people who are already sedentary and overweight. For people prone to insulin resistance, eating more unsaturated fats, protein,

QUICK STATS

2.9 million
American teenagers
have metabolic
syndrome.

—American Heart Association,
2010

triglyceride A type of blood fat that can be a predictor of heart disease.

TERMS

Table 15.4**Defining Characteristics of Metabolic Syndrome***

Abdominal obesity (waist circumference)	
Men	≥ 40 in (≥ 102 cm)
Women	≥ 35 in (≥ 88 cm)
Triglycerides	≥ 150 mg/dl
HDL cholesterol	
Men	< 40 mg/dl or drug-treated
Women	< 50 mg/dl or drug-treated
Blood pressure	$\geq 130/\geq 85$ mmHg or drug-treated
Fasting glucose	≥ 100 mg/dl or drug-treated

*A person is diagnosed with metabolic syndrome if she or he has three or more of the risk factors listed here.

SOURCE: Adapted with permission of the American Heart Association from Table 2. Grundy, S. M., et al. 2005. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute scientific statement. *Circulation* 112: 2735.

vegetables, and fiber while limiting added sugars and starches may be beneficial.

Psychological and Social Factors Many of the psychological and social factors that influence other areas of wellness are also important risk factors for CVD. The cardiovascular system is affected by both sudden, acute episodes of mental stress and the more chronic underlying emotions of anger, anxiety, and depression.

STRESS Excessive stress can strain the heart and blood vessels over time and contribute to CVD. When you experience stress, stress hormones activate the sympathetic nervous system. As described in Chapter 2, the sympathetic nervous system causes the fight-or-flight response; this response increases heart rate and blood pressure so that more blood is distributed to the heart and other muscles in anticipation of physical activity. Blood glucose concentrations and cholesterol also increase to provide a source of energy, and the platelets become activated so they will be more likely to clot in case of injury. If you are healthy, you can tolerate the cardiovascular responses that take place during stress; but if you already have CVD, stress can lead to adverse outcomes such as abnormal heart rhythms (arrhythmias) and heart attacks.

Because avoiding all stress is impossible, having healthy mechanisms to cope with it is your best defense. Instead of adopting unhealthy habits such as smoking or overeating, use healthier coping strategies such as exercising, getting enough sleep, and talking to others.

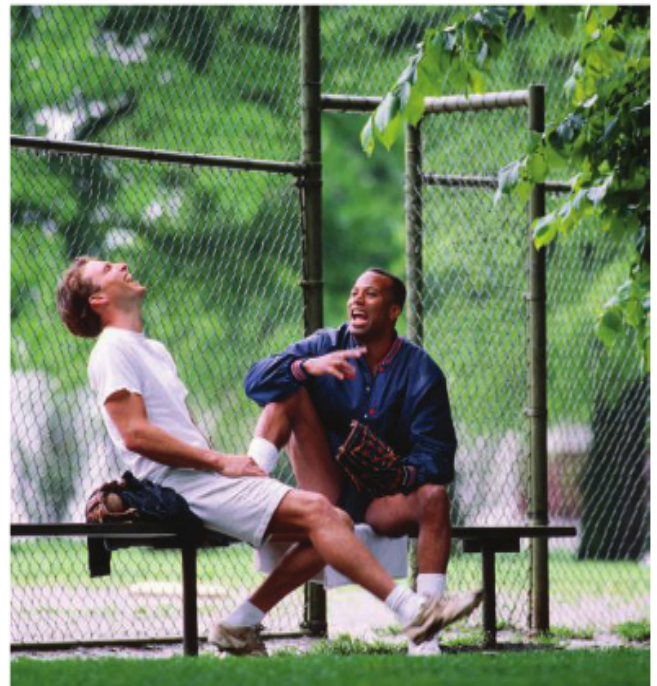
CHRONIC HOSTILITY AND ANGER Certain traits in the hard-driving Type A personality—hostility, cynicism, and anger—are associated with increased risk of heart disease. Men prone to anger have two to three times the heart attack risk of calmer men and are much more likely to develop

CVD at young ages. In a 10-year study of young adults aged 18–30 years, those with high hostility levels were more than twice as likely to develop coronary artery calcification (a marker of early atherosclerosis) as those with low hostility levels. See the box “Anger, Hostility, and Heart Disease” for more information.

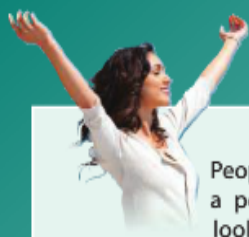
SUPPRESSING PSYCHOLOGICAL DISTRESS Consistently suppressing anger and other negative emotions may also be hazardous to a healthy heart. People who hide psychological distress appear to have higher rates of heart disease than people who experience similar distress but share it with others. People with such Type D personalities tend to be pessimistic, negative, and unhappy and to suppress these feelings. This Type D trait may have physical effects, or it may lead to social isolation and poor communication with physicians.

DEPRESSION Depression appears to increase the risk of CVD in healthy people, and it definitely increases the risk of adverse cardiac events in those who already have heart disease. You do not need to have a major depressive disorder to be affected: for each depressive symptom you have, the risk seems to increase in a linear fashion (see Chapter 3 for symptoms of depression).

Depression is common in people with CHD, and patients who are depressed tend to have worse outcomes than those who are not. Up to one-third of patients experience major depression within one year of having a heart attack, and those who are depressed after having a heart attack are more likely



A strong social support network is a major antidote to stress and can help promote and support a healthy lifestyle, such as opportunities for exercise and relaxation.



EMBRACING WELLNESS

Anger, Hostility, and Heart Disease

People with a quick temper, a persistently hostile outlook, and a cynical, mistrusting attitude toward life are more likely to develop heart disease than those with a calmer, more trusting attitude. People who are angry frequently and for long periods experience the stress response much more often than more relaxed individuals. Over the long term, the effects of stress may damage arteries and promote CVD.

Are You Too Hostile?

To help answer that question, Duke University researcher Redford Williams, M.D., has devised a short self-test. It's not a scientific evaluation, but it offers a rough measure of hostility. Are the following statements true or false for you?

1. I often get annoyed at checkout cashiers or the people in front of me when I'm waiting in line.
2. I usually keep an eye on the people I work or live with to make sure they do what they should.
3. I often wonder how homeless people can have so little respect for themselves.
4. I believe that most people will take advantage of you if you let them.
5. The habits of friends or family members often annoy me.
6. When I'm stuck in traffic, I often start breathing faster and my heart pounds.
7. When I'm annoyed with people, I really want to let them know it.
8. If someone does me wrong, I want to get even.
9. I'd like to have the last word in any argument.



10. At least once a week, I have the urge to yell at or even hit someone.

According to Williams, five or more "true" statements suggest that you're excessively hostile and should consider taking steps to mellow out.

Managing Your Anger

Begin by monitoring your angry responses and looking for triggers—people or situations that typically make you angry. Familiarize yourself with the patterns of thinking that lead to angry or hostile feelings, and then try to head them off before they develop into full-blown anger. If you feel your anger starting to build, try reasoning with yourself by asking the following questions:

1. *Is this really important enough to get angry about?*
2. *Am I really justified in getting angry?*
3. *Is getting angry going to make a real and positive difference in this situation?*

If you answer yes to all three questions, then calm but assertive communication may be an appropriate response. If your anger isn't reasonable, try distracting yourself or removing yourself from the situation. Exercise, humor, social support, and other stress management techniques can also help (see Chapter 3 for additional anger management tips). Your heart—and the people around you—will benefit from your calmer, more positive outlook.

SOURCE: Virginia Williams and Redford Williams. 1999. *Lifeskills: 8 Simple Ways to Build Stronger Relationships, Communicate More Clearly, and Improve Your Health*. New York: Times Books. Reprinted by permission.

to have another heart attack or die of a cardiac cause. Even in those with CHD who have not had a recent cardiac event, up to 20% have depression, and this number may be even higher in women. Major depressive disorder at the time of treatment for coronary artery disease is associated with both short- and long-term complications, including subsequent heart attack and death.

The relationship between depression and CHD is complex and not fully understood. Depressed people may be more likely to smoke or be sedentary. They may not consistently take prescribed medications, and they may not cope well with having an illness or undergoing a medical procedure. Depression also causes physiological changes; for example, it elevates basal

levels of stress hormones, which induce a variety of stress-related responses.

ANXIETY There is evidence to suggest that chronic anxiety and anxiety disorders (such as phobias and panic disorder) are associated with up to a threefold increased risk of coronary heart disease, heart attack, and sudden cardiac death. There is also some evidence that, similar to people with depression, people with anxiety are more likely to have a subsequent adverse cardiac event after having a heart attack. At the same time, people with anxiety and depression often have medically unexplained chest pain, meaning that no obvious coronary artery disease can be found. This can create difficulties in diagno-

sis and disease management, but it is important to always seek medical attention if you experience unexplained chest pain.

SOCIAL ISOLATION Social isolation and low social support (living alone, or having few friends or family members) are associated with an increased incidence of CHD and poorer outcomes after the first diagnosis of CHD. Elderly men and women who report less emotional support from others before they have a heart attack are almost three times more likely to die in the first six months after the heart attack. A strong social support network is a major antidote to stress. Friends and family members can also promote and support a healthy lifestyle.

LOW SOCIOECONOMIC STATUS Low socioeconomic status and low educational attainment are also associated with an increased risk of CVD. These associations are probably due to a variety of factors, including lifestyle and access to health care.

Alcohol and Drugs Although moderate drinking (defined as no more than one or two drinks per day for men and no more than one drink per day for women) may have health benefits for some people, drinking too much alcohol raises blood pressure and can increase the risk of stroke and heart failure.

Stimulant drugs, particularly cocaine and methamphetamines, can also cause serious cardiac problems, including heart attack, stroke, and sudden cardiac death. For example, cocaine stimulates the nervous system, promotes platelet aggregation, and can cause spasms in the coronary arteries. Injection drug use can cause heart infections and stroke. See Chapters 9 and 10 for more information about the use of alcohol and drugs.

Major Risk Factors That Can't Be Changed

A number of major risk factors for CVD cannot be changed. These include family history of CVD (heredity), aging, male gender, and ethnicity.

Heredity Multiple genes contribute to the development of CVD and its associated risk factors, such as high cholesterol, hypertension, diabetes, and obesity. Having a favorable set of genes decreases your risk of developing CVD; having an unfavorable set of genes increases your risk. Risk, however, may be modified by lifestyle factors such as whether you smoke, exercise, or eat a healthy diet.

Because of the genetic complexity of CVD, genetic screening is usually recommended for only a few specific conditions (for example, certain inherited cholesterol disorders); but you can learn more about your personal risk just by assessing your family history. If you have a first-degree relative (parent, sibling, child) who developed CAD before the age of 65, for example, you can have up to a two-fold increased risk of developing CAD yourself.

In general, men face a greater risk of heart attack, hypertension, and stroke than women.

Don't forget the role of lifestyle factors, however. Coronary artery disease is usually the result of the interaction of several unfavorable genetic and lifestyle factors, and people with the greatest number of genetic and lifestyle risk factors will face the highest risks. People with favorable genes may not develop CAD despite having an unhealthy lifestyle, and people with many healthy habits may still develop CAD because they have an unfavorable genetic makeup. People who inherit a tendency for CVD are not destined to develop it. They may, however, have to work harder than other people to prevent CVD.

Aging About 70% of all heart attack victims are age 65 or older, and about 75% who suffer fatal heart attacks are over 65. For people over 55, the incidence of stroke more than doubles in each successive decade. However, even people in their thirties and forties, especially men, can have heart attacks.

Gender Although CVD is the leading killer of both men and women in the United States, men face a greater risk of heart attack than women, especially earlier in life. Until age 55, men also have a greater risk of hypertension. The incidence of stroke is higher for males than females until age 65. Estrogen production, which is highest during the childbearing years, may protect premenopausal women against CVD. By age 75 this gender gap nearly disappears.

Risk factors for CVD are similar for men and women (age, family history, smoking, hypertension, high cholesterol, and diabetes) but there are gender differences. HDL appears to be an even more powerful predictor of CAD risk in women than in men. Also, women with diabetes have a greater risk of having CVD events like heart attack and stroke than men with diabetes.

Women who have heart attacks are more likely than men to die within a year. One reason is that because women develop heart disease at older ages, they are more likely to have other health problems that complicate treatment. There also may be biological or psychosocial risk factors contributing to women's mortality.

Ethnicity Rates of heart disease vary among ethnic groups in the United States, with African Americans having much higher rates of hypertension, heart disease, and stroke than other groups (see the box "Ethnicity and CVD"). Figure 15.2 compares rates of CVD among non-Hispanic whites, blacks, and Mexican Americans in the United States. Puerto Rican Americans, Cuban Americans, and Mexican Americans are also more likely to suffer from high blood pressure and angina (a warning sign of blocked coronary arteries) than non-Hispanic white Americans. Asian Americans historically have had far lower rates of CVD than white Americans.

Inflammation and C-Reactive Protein Inflammation plays a key role in the development of CVD. When an artery is



DIVERSITY MATTERS

Ethnicity and CVD

Although cardiovascular disease is the leading cause of death for all Americans, there is a higher prevalence of CVD in adult African Americans, and a higher prevalence of many associated risk factors in Mexican Americans, than in whites and Asian Americans. The reasons for these disparities likely include both genetic and environmental factors.

African Americans are at substantially higher risk of death from CVD than other groups. The rate of hypertension among African Americans is among the highest of any group in the world. Blacks tend to develop hypertension at an earlier age than whites, and their average blood pressures are much higher. African Americans have a higher risk of stroke, have strokes at younger ages, and if they survive, have more significant stroke-related disabilities. Some experts recommend that blacks be treated with antihypertensive drugs when blood pressure reaches 130/80 rather than the typical 140/90 cutoff for hypertension.

A number of genetic and biological factors may contribute to CVD in African Americans. They may be more sensitive to dietary sodium, leading to greater blood pressure elevation in response to a given amount of sodium. African Americans may also experience less dilation of blood vessels in response to stress, an attribute that also raises blood pressure.

Heredity also plays a large role in the tendency to develop diabetes, another important CVD risk factor that is more common in blacks than whites. However, Latinos are even more likely to develop diabetes and insulin resistance, and at a younger age, than African Americans. There is variation within the Latino population, however: a higher prevalence of diabetes occurs among Mexican Americans and Puerto Ricans and a relatively lower prevalence among Cuban Americans.

Another factor that likely contributes to the high incidence of CVD among ethnic minority groups is low income, which usually means reduced access to health care. Also associated with low income is low educational attainment, which often means

less information about preventive health measures, such as diet and stress management. People with low incomes tend to smoke more, use more salt, and exercise less than those with higher incomes.

Discrimination may also play a role in CVD. Physicians and hospitals may treat the medical problems of ethnic minorities differently than those of whites. Discrimination, low income, and other forms of deprivation may also increase stress, which is linked with hypertension and CVD. Lack of access to care, such as insurance coverage and availability of high-tech cardiac equipment in hospitals that serve minorities, may also play a role.

All Americans are advised to have their blood pressure checked regularly, exercise, eat a healthy diet, manage stress, and avoid smoking. These general preventive strategies may be particularly helpful for ethnic minorities. Tailoring your lifestyle to your particular ethnic risk may also be helpful in some cases. Discuss your particular risk profile with your physician to help identify the lifestyle changes most appropriate for you.

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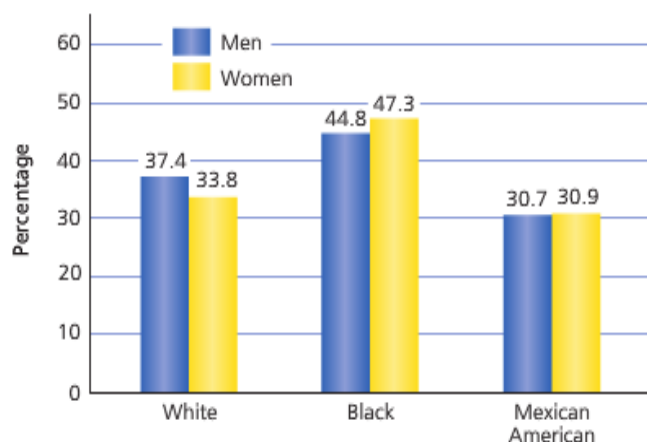
injured by smoking, cholesterol, hypertension, or other factors, the body's response is to produce inflammation. A substance called *C-reactive protein (CRP)* is released into the bloodstream during the inflammatory response, and high

levels of CRP indicate a substantially elevated risk of heart attack and stroke. CRP may also harm the coronary arteries themselves.

The CDC and the American Heart Association recommend that it is reasonable to test for CRP levels in people at intermediate risk for CVD because people in this risk category with high CRP levels may benefit from additional testing or treatment. (This guideline assumes that people at high risk for CVD are already receiving treatment.)

Lifestyle changes and certain drugs can reduce CRP levels. Statin drugs, widely prescribed to lower cholesterol, also decrease inflammation and reduce CRP levels. Patients who receive intensive statin treatment fare better than patients who receive less aggressive treatment that primarily targets LDL levels. The reduction in risk from decreased CRP levels is independent of changes in LDL levels.

The benefits of statins were confirmed in 2008, when findings were released from a study involving 18,000 patients in 26 countries. Volunteers who took statins reduced their risk of CVD by about 50% even if they had normal cholesterol levels. The patients had undergone a simple blood test that checked for inflammation by measuring levels of CRP; because statins lower CRP regardless of cholesterol levels, researchers concluded that CRP levels and inflammation are important markers of CVD risk.



VITAL STATISTICS

FIGURE 15.2 Percentage of adult Americans with cardiovascular disease.

SOURCE: American Heart Association. 2012. *Heart Disease and Stroke Statistics—2012 Update*. Dallas: American Heart Association.

Possible Risk Factors Currently Being Studied

In recent years other possible risk factors for cardiovascular disease have been identified. These range from levels of various amino acids in the blood to infectious agents and even the season of the year. All of these risk factors are currently under study.

Homocysteine Elevated levels of homocysteine, an amino acid circulating in the blood, are associated with an increased risk of CVD. Homocysteine appears to damage the lining of blood vessels, resulting in inflammation and the development of fatty deposits in artery walls. These changes can lead to the formation of clots and blockages in arteries, which in turn can cause heart attacks and strokes. High homocysteine levels are also associated with cognitive impairment, such as memory loss.

Infectious Agents Several infectious agents have been identified as possible culprits in the development of CVD. *Chlamydia pneumoniae*, a common cause of flu-like respiratory infections, has been found in sections of clogged, damaged arteries but not in sections of healthy arteries. This effect may be secondary to the inflammation that many of these infectious agents produce in the body. It does not appear that antibiotic treatment for *C. pneumoniae* reduces risk, but further research is needed. Other infectious agents may also play a role in CVD.

Lipoprotein(a) A high level of a specific type of LDL called lipoprotein(a), or Lp(a), may be a risk factor for CHD, especially when associated with high LDL or low HDL levels. Lp(a) is thought to contribute to CVD by promoting clots and delivering cholesterol to a site of vascular injury. Lp(a) levels have a strong genetic component and are difficult to treat. Lp(a) levels tend to increase with age and vary by race, with higher levels found in African Americans than in whites. About 25% of the U.S. population has elevated lipoprotein(a) levels.

LDL Particle Size LDL particles differ in size and density, and concentrations of different particles vary among individuals. LDL cholesterol profiles can be divided into three general types: People with pattern A have mostly large, buoyant LDL particles; people with pattern B have mostly small, dense LDL particles; and people with pattern C have a mixture of particle types. Small, dense LDL particles pose a greater CVD risk than large particles; thus people with LDL pattern B are at greatest risk for CVD. Exercise, a low-fat diet, and certain lipid-lowering drugs may help lower CVD risk in people with pattern B. In a recent study of men who walked or jogged 12–20 miles per week, total cholesterol and LDL levels were often unchanged, but the LDL particles became larger and less dense.

Blood Viscosity and Iron High blood viscosity (thickness) may increase the risk of CVD, as may excess iron stores, especially for men and postmenopausal women (iron stores are usually lower in younger women because of menstrual blood loss). Regular blood donation, which reduces iron stores and blood viscosity, is associated with lower CVD risk

in men. Drinking five or more glasses of water a day may also reduce risk by reducing blood viscosity. On the flip side, high consumption of heme iron—found in meat, fish, and poultry—is associated with an increased risk of heart attack. Men and postmenopausal women should consult a physician before taking iron supplements.

Uric Acid Recent research suggests a link between high blood levels of uric acid and CVD mortality, particularly among postmenopausal women and African Americans. Uric acid may raise CVD risk by increasing inflammation and platelet aggregation or by influencing the development of hypertension. High uric acid levels also cause gout (a type of arthritis), kidney stones, and certain forms of kidney disease. Medications to lower uric acid levels are available, but it is not yet known if they are useful in preventing CVD.

Time of Day and Time of Year More heart attacks and sudden cardiac deaths occur between 6:00 a.m. and noon than during other times of the day. This trend may be explained by the natural increase in adrenaline and cortisol levels that occurs

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What risk factors do you have for cardiovascular disease? Which ones are factors you have control over, and which are factors you can't change? If you have risk factors you cannot change (such as a family history of CVD), were you aware that you can make lifestyle adjustments to reduce your risk? Do you think you will make them?



More heart attacks occur in winter than in summer, and more heart attacks occur in the morning than other times of the day. Several different explanations have been proposed for both phenomena.

in the morning and by an increase in the sympathetic nervous system activity at the beginning of the day. Blood pressure is often lowest during sleep and highest in the morning, and endothelial function may be impaired in the early morning.

There is also a seasonal pattern of heart attacks, with up to 50% more occurring in winter months than in summer months. Heart attacks that occur in winter also tend to be more often fatal than those that occur during summer. Possible explanations include low temperatures, which can constrict blood vessels; bursts of exertion, such as snow shoveling; increased rates of smoking; increased stress and depression, including seasonal affective disorder (see Chapter 3); holiday-related episodes of high-fat eating and binge drinking; and physiological factors, including levels of cholesterol and C-reactive protein, which appear to rise in winter. People who have symptoms of heart trouble may also be more reluctant to seek help during the holidays.

MAJOR FORMS OF CARDIOVASCULAR DISEASE

Although deaths from CVD have declined drastically over the past 60 years, it remains the leading cause of death in America. According to the CDC, heart diseases killed nearly 616,000 Americans in 2008. Figure 15.3 shows the death rates among various ethnic groups due to heart disease in 2008, the most recent year for which data are available.

The main forms of CVD are atherosclerosis, coronary artery disease and heart attack, stroke, peripheral arterial disease (PAD), congestive heart failure, congenital heart disease, rheumatic heart disease, and heart valve problems. Many forms are interrelated and have elements in common; we

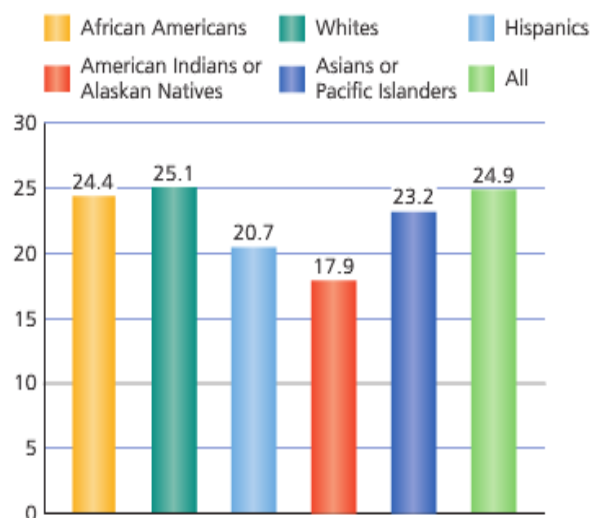
treat them separately here for the sake of clarity. Hypertension, which is both a major risk factor and a form of CVD, was described earlier in the chapter.

Atherosclerosis

Atherosclerosis is a form of arteriosclerosis, or thickening and hardening of the arteries. In atherosclerosis, arteries become narrowed by deposits of fat, cholesterol, and other substances (see page T2-4 of the color transparency insert “Touring the Cardiorespiratory System”). The process begins when the endothelial cells (cells that line the arteries) become damaged, most likely through a combination of factors such as smoking, high blood pressure, high insulin or glucose levels, and deposits of oxidized LDL particles. The body’s response to this damage results in inflammation and changes in the artery lining that create a magnet for LDL, platelets, and other cells. These cells build up and cause a bulge in the wall of the artery. As these deposits, called **plaques**, accumulate in artery walls, the arteries lose their elasticity and their ability to expand and contract, restricting blood flow. Once narrowed by a plaque, an artery is vulnerable to blockage by blood clots. The risk of life-threatening clots and heart attacks increases if the fibrous cap covering a plaque ruptures.

If the heart, brain, or other organs are deprived of blood and the oxygen it carries, the effects of atherosclerosis can be deadly. Coronary arteries, which supply the heart with blood, are particularly susceptible to plaque buildup, a condition called **coronary heart disease (CHD)** or *coronary artery disease (CAD)*. The blockage of a coronary artery causes a heart attack, and blockage of a cerebral artery (leading to the brain) causes a stroke. Blockage of an artery in a limb causes *peripheral arterial disease*, a condition that causes pain and sometimes amputation of the affected limb.

The main risk factors for atherosclerosis are cigarette smoking, physical inactivity, high blood cholesterol levels, high blood pressure, and diabetes. Atherosclerosis often begins in childhood: autopsy studies of young trauma victims have revealed atherosclerosis of the coronary arteries in adolescents.



VITAL STATISTICS

FIGURE 15.3 Percentage of deaths due to heart disease, by ethnic group.

SOURCE: Miniño, A. M., et al. 2011. Deaths: final data for 2008. *National Vital Statistics Reports* 59(10). Hyattsville, MD: National Center for Health Statistics.

Coronary Artery Disease and Heart Attack

The most common form of heart disease is coronary artery disease caused by atherosclerosis. When one of the coronary arteries becomes blocked, the result is a **heart attack**, or

plaque A deposit of fatty (and other) substances on the inner wall of an artery.

TERMS

coronary heart disease (CHD) Heart disease caused by atherosclerosis in the arteries that supply blood to the heart muscle; also called *coronary artery disease*.

heart attack Damage to, or death of, heart muscle, resulting from a failure of the coronary arteries to deliver enough blood to the heart; also known as *myocardial infarction (MI)*.

Table 15.5**Deaths from Acute Myocardial Infarction, 2007**

AGE	DEATHS
Birth–24	79
25–44	2,802
45–64	27,302
65 and older	102,781

SOURCE: National Center for Health Statistics. 2010. Deaths: final data for 2007. *National Vital Statistics Reports* 58(19): 1–73. Hyattsville, MD: National Center for Health Statistics.

myocardial infarction (MI). During a heart attack, the heart muscle (the myocardium) is damaged, and part of it may die from lack of blood. Although a heart attack may come without warning, it usually results from a chronic disease process.

Myocardial infarctions are a significant cause of death in the United States, especially among people aged 65 and older (Table 15.5). The average age for a first heart attack is 66 for men and 70 for women.

Heart attack symptoms may include the following:

- Chest pain or pressure.
- Arm, neck, or jaw pain.
- Difficulty breathing.
- Excessive sweating.
- Nausea and vomiting.
- Loss of consciousness.

Most people having a heart attack suffer chest pain, but about one-third of heart attack victims do not. Women, ethnic minorities, older adults, and people with diabetes are the most likely groups to experience heart attacks without chest pain.

Women presenting are likely to report non-chest-pain symptoms, which may obscure the diagnosis of heart disease. These “nontypical” symptoms include fatigue, weakness, shortness of breath, nausea, vomiting, and pain in the abdomen, neck, jaw, and back. Women are also more likely to have pain at rest, during sleep, or with mental stress. A woman who experiences these symptoms should be persistent in seeking accurate diagnosis and appropriate treatment. The American Heart Association estimates that 785,000 people have a first heart attack each year; 470,000 people have a recurrent attack. An estimated 195,000 people suffer a symptomless or “silent” heart attack each year.

Angina Arteries narrowed by disease may still be open enough to deliver blood to the heart. At times, however—during stress or exertion, for example—the heart needs more oxygen than can flow through narrowed arteries. When the need for oxygen exceeds the supply, chest pain, called **angina pectoris**, may occur.

Angina pain is usually felt as an extreme tightness in the chest and heavy pressure behind the breastbone or in the shoulder,



Automated external defibrillators can save the lives of individuals experiencing sudden cardiac arrest. AEDs are becoming more common in public places.

neck, arm, hand, or back. This pain is usually relieved by rest or medicine called nitroglycerin. This pain, although not actually a heart attack, is a warning that the load on the heart must be reduced. The symptoms of angina are often very difficult to distinguish from a heart attack. Any severe chest pain that lasts more than a few minutes should be considered life-threatening, and emergency medical help should be sought immediately.

Angina may be controlled in a number of ways (with drugs and surgical or nonsurgical procedures), but its course is unpredictable. Over a period ranging from hours to years, the narrowing may go on to full blockage and a heart attack.

Arrhythmias and Sudden Cardiac Death The pumping of the heart is controlled by electrical impulses from the sinus node that maintain a regular heartbeat of 60–100 beats per minute. If this electrical conduction system is disrupted, the heart may beat too quickly, too slowly, or in an irregular fashion—a condition known as an **arrhythmia**. Arrhythmias can cause symptoms ranging from imperceptible to severe and even fatal.

angina pectoris Pain in the chest, and often in the left arm and shoulder, caused by the heart muscle not receiving enough blood. The pain is usually brought on by exercise or stress.

arrhythmia A change in the heartbeat's normal pattern.

TERMS

Sudden cardiac death, also called *cardiac arrest*, is most often caused by an arrhythmia called *ventricular fibrillation*, a kind of quivering of the ventricle that makes it ineffective in pumping blood. If ventricular fibrillation continues for more than a few minutes, it is generally fatal. Cardiac defibrillation, in which an electrical shock is delivered to the heart, can be effective in jolting the heart into a more efficient rhythm. Emergency personnel typically carry defibrillators, and automated external defibrillators (AEDs) are becoming increasingly available in public places for use by the general public. AEDs monitor the heart's rhythm and, if appropriate, deliver an electrical shock. (Training in the use of AEDs is available from organizations such as the American Red Cross and the American Heart Association.) Sudden cardiac death most often occurs in people with coronary heart disease. Serious arrhythmias frequently develop during or after a heart attack and are often the actual cause of death in cases of a fatal myocardial infarction.

Other potential causes of arrhythmia include congenital heart abnormalities, infections, drug use, abnormal concentrations of electrolytes, chest trauma, and congestive heart failure. Some arrhythmias cause no problems and resolve without treatment; more serious arrhythmias are usually treated with medication or a surgically implanted pacemaker or defibrillator that delivers electrical stimulation to the heart to create a more normal rhythm.

Helping a Heart Attack Victim Most deaths from heart attacks occur within two hours of the first symptoms. Unfortunately half of all heart attack victims wait more than two hours before getting help. If you or someone you are with has any of the warning signs of heart attack listed in the box "What to Do in Case of a Heart Attack, Stroke, or Cardiac Arrest," take immediate action. Get help even if the person denies there is something wrong. Many experts also suggest that the heart attack victim chew and swallow one adult aspirin tablet (325 mg) as soon as possible after symptoms begin. Aspirin has an immediate anticlotting effect.

If the victim loses consciousness, a qualified person should immediately start administering emergency **cardiopulmonary resuscitation (CPR)**. Damage to the heart muscle increases with time. If the person receives emergency care quickly enough, a clot-dissolving agent or emergency surgical procedure can be used to break up the clot in the coronary artery.

Detecting and Treating Heart Disease Physicians have an expanding array of tools to evaluate the condition of the heart and its arteries. Currently the most common initial screening tool for CAD is the stress, or exercise, test. During an exercise stress test, a patient runs or walks on a treadmill or pedals a stationary cycle while being monitored for abnormalities with an **electrocardiogram (ECG or EKG)**. Certain characteristic changes in the heart's electrical activity while under stress can reveal particular heart problems, such as restricted blood flow. Exercise testing can also be performed in conjunction with imaging techniques



This coronary angiogram shows a patient with diffuse coronary calcifications. The coronary arteries and the calcifications along the arteries have been color enhanced.

such as nuclear medicine or echocardiography that provide pictures of the heart, which can help pinpoint abnormal areas of the heart.

Other tests for evaluating CHD include the following:

- **Electron-beam computed tomography (EBCT)** uses a sweeping electron beam to produce computerized cross-sectional images of calcium in the arteries, which is a marker for atherosclerosis.
- **Echocardiography** utilizes sound waves to examine the heart's pumping function and valves.
- **Multi-slice computed tomography (MSCT)** is another type of CT that produces thinly sliced images of the heart, allowing physicians to see very small structures such as the coronary arteries.

sudden cardiac death A nontraumatic, unexpected death from sudden cardiac arrest, most often due to arrhythmia; in most instances, victims have underlying heart disease.

TERMS

cardiopulmonary resuscitation (CPR) A technique involving mouth-to-mouth breathing and/or chest compressions to keep oxygen flowing to the brain.

electrocardiogram (ECG or EKG) A test to detect cardiac abnormalities by evaluating the electrical activity in the heart.

TAKE CHARGE

What to Do in Case of a Heart Attack, Stroke, or Cardiac Arrest



Warning Signs of Heart Attack

Some heart attacks are sudden and intense—the “movie heart attack,” where no one doubts what’s happening. But most heart attacks start slowly with mild pain or discomfort. Often people affected aren’t sure what’s wrong and wait too long before getting help. Here are signs that can mean a heart attack is happening:

- **Chest discomfort.** Heart attacks often involve discomfort in the chest that lasts more than a few minutes, or that goes away and comes back. It can feel like uncomfortable pressure, squeezing, fullness, or pain.
- **Discomfort in other areas of the upper body.** Symptoms can include pain or discomfort in one or both arms, the back, neck, jaw, or stomach.
- **Shortness of breath.** May occur with or without chest discomfort.
- **Other signs:** These may include breaking out in a cold sweat, nausea, vomiting, or lightheadedness.

Not all the signs occur in every heart attack. As with men, women’s most common heart attack symptom is chest pain or discomfort, but women are somewhat more likely than men to experience some of the other symptoms, particularly shortness of breath, nausea/vomiting, and back or jaw pain.

If you or someone you’re with has chest discomfort, especially with one or more of the other signs, don’t wait longer than a few minutes (no more than five) before calling for help.

Calling 911 is almost always the fastest way to get lifesaving treatment. Emergency medical services staff can begin treatment when they arrive—up to an hour sooner than if someone gets to the hospital by car. The staff are also trained to revive someone whose heart has stopped. Patients with chest pain who arrive by ambulance usually receive faster treatment at the hospital, too. Today medications and treatments are available that weren’t available in the past, but they must be given relatively quickly after the heart attack to be effective.

If you can’t access emergency medical services (EMS), have someone drive you to the hospital right away. If you’re the one having symptoms, don’t drive yourself unless you have absolutely no other option.

- **Magnetic resonance imaging (MRI)** uses powerful magnets to look inside the body and generate pictures of the heart and blood vessels.
- **Nuclear myocardial perfusion imaging** injects radiotracers such as thallium-201 into the bloodstream. The radiotracers’ location and density in the heart can be imaged and quantified, which allows physicians to determine the blood flow to various areas of the heart and identify possible coronary artery disease.

Warning Signs of Stroke

- Sudden numbness or weakness of the face, arm, or leg, especially on one side of the body.
- Sudden confusion or trouble speaking or understanding.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness, or loss of balance or coordination.
- Sudden severe headache with no known cause.

If you or someone with you has one or more of these signs, don’t delay! Immediately call 911 or the emergency medical services (EMS) number so an ambulance (ideally with advanced life support) can be sent for you. Also, check the time so you’ll know when the first symptoms appeared. It’s very important to take immediate action. If given within three hours of the start of symptoms, a clot-busting drug called tissue plasminogen activator (tPA) can reduce long-term disability for the most common type of stroke. tPA is the only FDA-approved medication for the treatment of stroke within three hours of symptom onset.

Signs of Cardiac Arrest

Cardiac arrest strikes immediately and without warning. Here are the signs:

- Sudden loss of responsiveness.
- No response to tapping on the shoulders.
- No normal breathing. The victim does not take a normal breath when you tilt the head up and check for at least five seconds.

If these signs of cardiac arrest are present, tell someone to call 911 and to get an automated external defibrillator (AED) if one is available before you begin CPR. Use the AED as soon as it arrives.

SOURCE: Adapted from American Heart Association. 2005. *Heart Attack, Stroke, and Cardiac Arrest Warning Signs*. http://www.heart.org/HEARTORG/General/Heart-Attack-Stroke-and-Cardiac-Arrest-Signs_UCM_303977_SubHomePage.jsp. Copyright © 2007 American Heart Association. Reprinted with permission.

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- **Positron emission tomography (PET)** involves the use of positron-emitting isotopes to image and quantify regional blood flow in the heart and identify coronary artery disease. PET scans can also measure the metabolism of cells in the

magnetic resonance imaging (MRI) A computerized imaging technique that uses a strong magnetic field to create detailed pictures of body structures.

TERMS

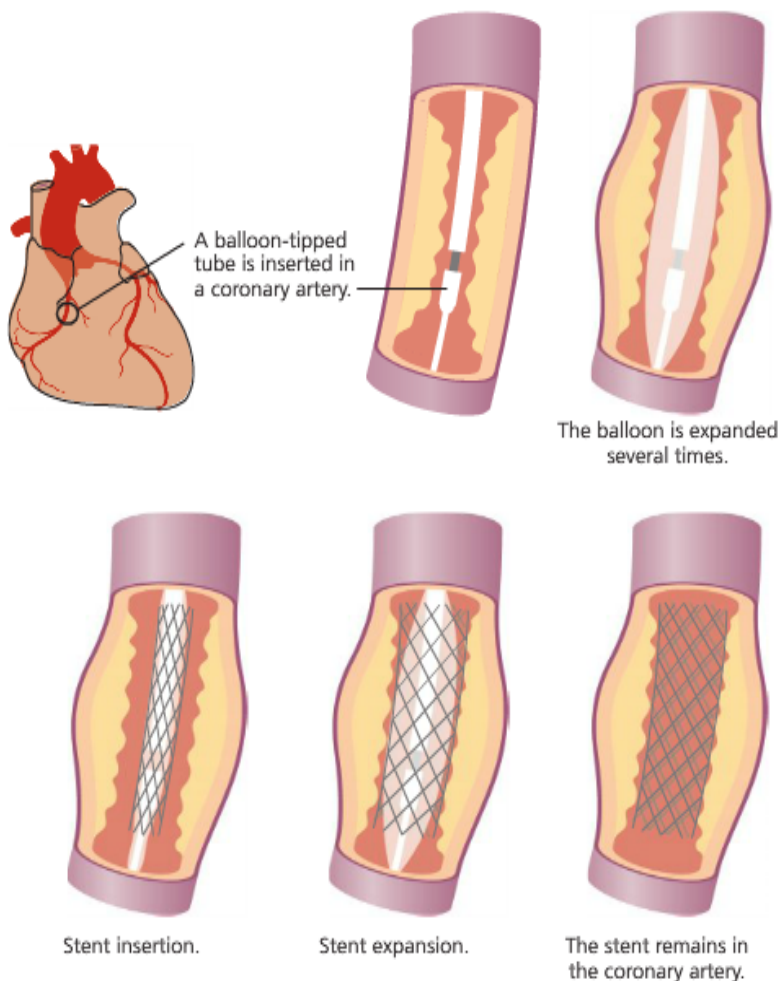


FIGURE 15.4 Balloon angioplasty and stenting.

heart and therefore determine which parts of the heart are no longer alive.

If symptoms or noninvasive tests suggest coronary artery disease, the next step is usually a coronary **angiogram**, performed in a cardiac catheterization lab. In this test, a catheter (a small plastic tube) is threaded into an artery, usually in the groin, and advanced through the aorta to the coronary arteries. The catheter is then placed into the opening of the coronary artery and a special dye is injected. The dye can be seen moving through the arteries via X-ray, and any narrowings or blockages can be identified. If a problem is found, it is commonly treated with a metal stent or **balloon angioplasty**, which is performed by specially trained cardiologists (Figure 15.4). This technique involves feeding a balloon-tipped catheter into the artery. The balloon is advanced to the site of the narrowing and then inflated, flattening the fatty plaque and widening the arterial opening.

Balloon angioplasty is generally followed by placement of a **stent**—a small metal tube that helps keep the artery open. Repeat clogging of the artery (*restenosis*) can occur, but the introduction of stents coated with medication, which is slowly released over a few months, significantly decreases the chance of restenosis.

Other treatments, ranging from medication to major surgery, are also available. Along with a low-fat diet, regular exercise, and smoking cessation, one frequent recommendation for people at intermediate to high risk for CVD is to take a low-dose aspirin tablet every day. Aspirin helps prevent platelets in the blood from sticking to arterial plaques and forming clots, and it also reduces inflammation. Low-dose aspirin therapy appears to help prevent first heart attacks in men, second heart attacks in men and women, and strokes in women over age 65.

Prescription drugs can help control heart rate, dilate arteries, lower blood pressure, and reduce the strain on the heart—improving both the quality and length of life in heart patients. In patients with coronary artery disease, cholesterol-lowering statins are effective in preventing heart attacks; statins also have beneficial anti-inflammatory effects.

In **coronary bypass surgery**, surgeons remove a healthy blood vessel—usually a vein from the patient's leg—and graft it from the aorta to one or more coronary arteries to bypass a blockage.

Stroke

For brain cells to function as they should, they must have a continuous supply of oxygen-rich blood. If brain cells are deprived of blood for more than a few minutes, they die. A **stroke**, also called a *cerebrovascular accident* (CVA), occurs when the blood supply to the brain is cut off. One study found that about 2 million brain cells die per minute and the brain ages about 3.5 years each hour during a stroke.

In the past, not much could be done for stroke victims. Today, however, prompt treatment can greatly decrease the risk of permanent disability. Everyone should know the warning signs of a stroke and seek immediate medical help, just as they would at the first sign of a heart attack.

Types of Strokes There are two major types of strokes (Figure 15.5), which are described in the following sections.

angiogram A picture of the arterial system taken after injecting a dye that is opaque to X-rays.

TERMS

balloon angioplasty A technique in which a catheter with a deflated balloon on the tip is inserted into an artery; the balloon is then inflated at the point of obstruction in the artery, pressing the plaque against the artery wall to improve blood supply.

coronary bypass surgery Surgery in which a blood vessel is grafted from the aorta to a point below an obstruction in a coronary artery, improving the blood supply to the heart.

stroke Impeded blood supply to some part of the brain resulting in the destruction of brain cells; also called a *cerebrovascular accident*.

HEMORRHAGIC STROKE

- 13% of strokes.
- Caused by ruptured blood vessels followed by blood leaking into tissue.
- Usually more serious than ischemic stroke.

Subarachnoid hemorrhage

- A bleed into the space between the brain and the skull.
- Develops most often from an *aneurysm*, a weakened, ballooned area in the wall of an artery.

Intracerebral hemorrhage

- A bleed from a blood vessel inside the brain.
- Often caused by high blood pressure and the damage it does to arteries.

ISCHEMIC STROKE

- 87% of strokes.
- Caused by blockages in brain blood vessels; potentially treatable with clot-busting drugs.
- Brain tissue dies when blood flow is blocked.

Embolic stroke

- Caused by *emboli*, blood clots that travel from elsewhere in the body to the brain blood vessels.
- 25% of embolic strokes are related to atrial fibrillation.

Thrombotic stroke

- Caused by *thrombi*, blood clots that form where an artery has been narrowed by atherosclerosis.
- Most often develops when part of a thrombus breaks away and causes a blockage in a downstream artery.

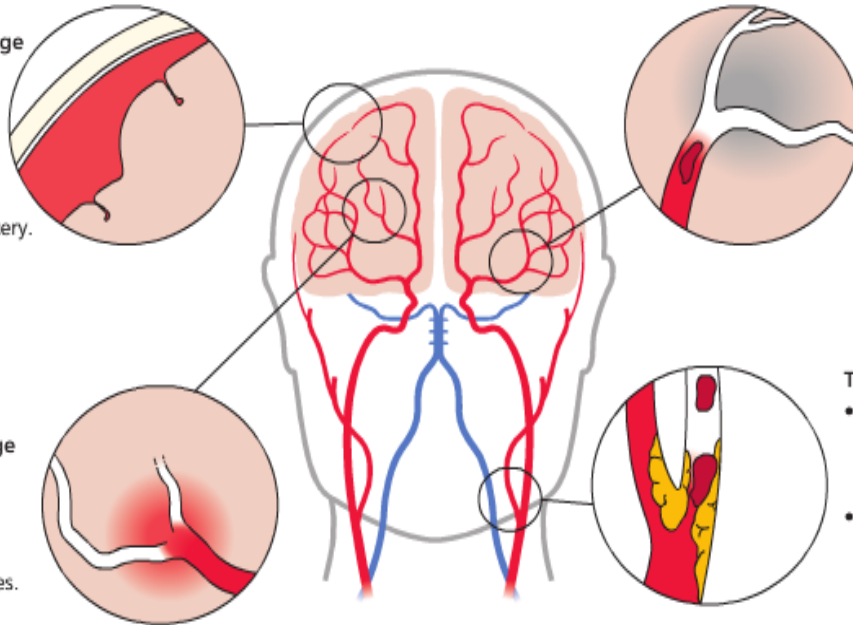


FIGURE 15.5 Types of stroke.

SOURCE: Excerpted from *Harvard Health Letter*, April 2000. © 2000 Harvard University. Reprinted with permission. For more information visit <http://www.health.harvard.edu>.

ISCHEMIC STROKE An ischemic stroke is caused by a blockage in a blood vessel. There are two types of ischemic strokes:

- A *thrombotic stroke* is caused by a **thrombus**, which is a blood clot that forms in a cerebral or carotid artery that has been narrowed or damaged by atherosclerosis.
- An *embolic stroke* is caused by an **embolus**, which is a wandering blood clot that is carried in the bloodstream and may become wedged in a cerebral artery. Many embolic strokes are linked to a type of abnormal heart rhythm called *atrial fibrillation*. When this arrhythmia occurs, blood may pool in the left atrium and form a clot that travels to the brain.

Ischemic strokes, which account for 87% of all strokes, are potentially treatable with clot-busting drugs, so immediate medical help is critical to improving the victim's chances of recovery.

HEMORRHAGIC STROKE A hemorrhagic stroke occurs when a blood vessel in the brain bursts, spilling blood into the surrounding tissue. Cells normally nourished by the vessel are deprived of blood and cannot function. In addition, accumulated blood from the burst vessel may put pressure on surrounding brain tissue, causing damage and even death. There are two types of hemorrhagic strokes:

QUICK

STATS

795,000

Americans suffer strokes each year.

—American Heart Association, 2011

- In an *intracerebral hemorrhage*, a blood vessel ruptures within the brain. About 10% of strokes are caused by intracerebral hemorrhages.

- In a *subarachnoid hemorrhage*, a blood vessel on the brain's surface ruptures and bleeds into the space between the brain and the skull. About 3% of strokes are of this type.

Hemorrhages can be caused by head injuries or the bursting of a malformed blood vessel or **aneurysm**, which is a blood-filled pocket that bulges out from a weak spot in the artery wall. Aneurysms in the brain may remain

TERMS

Ischemic stroke Impeded blood supply to the brain caused by the obstruction of a blood vessel by a clot.

thrombus A blood clot in a blood vessel that usually remains at the point of its formation.

embolus A blood clot that breaks off from its place of origin in a blood vessel and travels through the bloodstream.

hemorrhagic stroke Impeded blood supply to the brain caused by the rupture of a blood vessel.

aneurysm A sac formed by a distention or dilation of the artery wall.

stable and never break. But when they do, the result is a stroke. Aneurysms may be caused or worsened by hypertension.

The Effects of a Stroke The interruption of the blood supply to any area of the brain prevents the nerve cells there from functioning—in some cases causing death. Stroke survivors usually have some lasting disability. Which parts of the body are affected depends on the area of the brain that has been damaged. Brain cells control sensation and most of our body movements, and a stroke may cause paralysis, walking disability, speech impairment, memory loss, or changes in behavior. The severity of the stroke and how long the effects last depend on which brain cells have been injured, how widespread the damage is, how effectively the body can restore the blood supply, and how rapidly other areas of the brain can take over the functions of the damaged areas. Early treatment can significantly reduce the severity of disability resulting from a stroke.

Detecting and Treating Stroke Death rates from stroke have declined significantly over the past decades—from nearly 90% in 1950 to about 19% today. Effective treatment requires the prompt recognition of symptoms and correct diagnosis of the type of stroke.

A quick way to recognize a stroke is to ask the person to do four simple things:

1. Ask the person to smile. If her smile droops on one side, or if she is unable to move or open one side of her mouth, she may be having a stroke.
2. Ask the person to hold his arms or legs out. If the person cannot move one arm/leg or hold one arm/leg still, it may be a sign of a stroke.
3. Ask the person to repeat a simple, short sentence, such as “Take me out to the ball game.” If she has trouble speaking or cannot speak, a stroke is possible.
4. Ask the person whether he has any decreased sensation, numbness, or abnormal tingling in his legs, arms, or other body parts.

If someone has difficulty performing any of these four tests, follow the steps described in the box “What to Do in Case of a Heart Attack, Stroke, or Cardiac Arrest.”

Many people have strokes without knowing it. These “silent strokes” do not cause any noticeable symptoms while they are occurring. Although they may be mild, silent strokes leave their victims at a higher risk for subsequent and more serious strokes. They also contribute to loss of mental and cognitive skills. In 2008 a study of MRI scans of 2000 elderly people revealed that 11% of the subjects had brain damage from one or more strokes but did not realize they had ever had a stroke.

Some stroke victims have a **transient ischemic attack (TIA)**, or “ministroke,” days, weeks, or months before they have a full-blown stroke. A TIA produces temporary stroke-like symptoms, such as weakness or numbness in an arm or a leg, speech difficulty, or dizziness. These symptoms are brief, often lasting just a few minutes, and do not cause permanent damage. TIAs should be taken as warning signs of a stroke,

however, and anyone with a suspected TIA should get immediate medical attention.

Strokes should be treated with the same urgency as heart attacks. A person with stroke symptoms should be rushed to the hospital. A **computed tomography (CT)** scan, which uses a computer to construct an image of the brain from X-rays, can assess brain damage and determine the type of stroke. Newer techniques using MRI and ultrasound are becoming increasingly available and should improve the speed and accuracy of stroke diagnosis.

If tests reveal that a stroke is caused by a blood clot—and if help is sought within a few hours of the onset of symptoms—the person can be treated with the same kind of clot-dissolving drugs that are used to treat coronary artery blockages. If the clot is dissolved quickly enough, brain damage is minimized and symptoms may disappear. The longer the brain goes without blood, the greater the risk of permanent damage.

People who have had TIAs or who are at high risk for stroke due to narrowing of the carotid arteries (large arteries on either side of the neck, which carry blood to the head) may undergo a surgical procedure called *carotid endarterectomy*, in which plaque is removed. There is also a nonsurgical procedure, similar to coronary angioplasty and stenting, for patients who are at increased risk of surgical complications.

If tests reveal that a stroke was caused by a cerebral hemorrhage, drugs may be prescribed to lower the blood pressure, which will usually be high. Careful diagnosis is crucial, because administering clot-dissolving drugs to a person suffering a hemorrhagic stroke could cause more bleeding and potentially more brain damage.

If detection and treatment of stroke come too late, rehabilitation is the only treatment. Although damaged or destroyed brain tissue does not normally regenerate, nerve cells in the brain can make new pathways, and some functions can be taken over by other parts of the brain. Some spontaneous recovery starts immediately after a stroke and continues for a few months.

Rehabilitation consists of physical therapy, which helps strengthen muscles and improve balance and coordination; speech and language therapy, which helps those whose speech has been damaged; and occupational therapy, which helps improve hand–eye coordination and everyday living skills. Some people recover completely in a matter of days or weeks, but most stroke victims who survive must adapt to some disability.

Peripheral Arterial Disease

Peripheral arterial disease (PAD) refers to atherosclerosis in the leg or arm arteries, which can eventually limit or completely obstruct blood flow. The same process that occurs in the heart

transient ischemic attack (TIA) A small stroke; usually a temporary interruption of blood supply to the brain, causing numbness or difficulty with speech.

computed tomography (CT) The use of computerized X-ray images to create a cross-sectional depiction (scan) of tissue density.

TERMS

arteries can occur in any artery of the body. In fact, patients with PAD frequently also have coronary artery disease and cerebrovascular disease, and they have an increased risk of death from CVD. PAD affects 8 to 12 million people in the United States.

The risk factors associated with coronary atherosclerosis, such as smoking, diabetes, hypertension, and high cholesterol, also contribute to atherosclerosis in the peripheral circulation. The risk of PAD is significantly increased in people with diabetes and people who smoke. The likelihood of needing an amputation is increased in those who continue to smoke, and PAD in people with diabetes tends to be extensive and severe. Patient with diabetes and PAD also have a more difficult time fighting infections or healing ulcerations that form in the leg or foot.

Symptoms of PAD include claudication and rest pain.

Claudication is aching or fatigue in the affected leg with exertion, particularly walking, which resolves with rest. Claudication occurs when leg muscles do not get adequate blood and oxygen supply. *Rest pain* occurs when the limb artery is unable to supply adequate blood and oxygen even when the body is not physically active. This occurs when the artery is significantly narrowed or completely blocked. If blood flow is not restored quickly, cells and tissues die; in severe cases, amputation may be needed. PAD is the leading cause of amputation in people over age 50.

The same disease process that occurs in the heart arteries can occur in any artery of the body.

Congestive Heart Failure

A number of conditions—high blood pressure, heart attack, atherosclerosis, alcoholism, illicit drug use, heart valve disease, viral infections, rheumatic fever, birth defects—can damage the heart's pumping mechanism. When the heart cannot maintain its regular pumping rate and force, fluid begins to back up. When extra fluid seeps through capillary walls, edema (swelling) results, usually in the legs and ankles, but sometimes in other parts of the body as well. Fluid can collect in the lungs and interfere with breathing, particularly when a person is lying down. This condition is called **pulmonary edema**, and the entire process is known as **congestive heart failure**. About 5 million Americans suffer from heart failure.

Congestive heart failure can be controlled. Treatment includes reducing the workload on the heart, modifying salt intake, and using drugs that help the body eliminate excess fluid. Drugs used to treat congestive heart failure improve the pumping action of the heart, lower blood pressure so the heart doesn't have to work as hard, and help the body eliminate excess salt and water. When medical therapy is ineffective, heart transplant or mechanical ventricular assist devices are solutions for some patients with severe heart failure, but the need greatly exceeds the number of donor hearts available.

The risk of heart failure increases with age, and being overweight is a significant independent risk factor. Experts fear that the incidence of heart failure will increase dramatically over the next few decades as our population ages and becomes increasingly obese.

Other Forms of Heart Disease

Other, less common, forms of heart disease include congenital heart disease, rheumatic heart disease, and heart valve disorders.

Congenital Heart Defects About 36,000 children born each year in the United States have a defect or malformation of the heart or major blood vessels. These conditions are collectively referred to as **congenital heart defects**, and they cause about 3600 deaths a year. Most of the common congenital defects can now be accurately diagnosed and treated with medication or surgery. Early recognition of heart disease in a newborn is important in saving lives. The most

common congenital defects are holes in the wall that divides the chambers of the heart. Such defects cause the heart to produce a distinctive sound, making diagnosis relatively simple. Another common defect is *coarctation of the aorta*—a narrowing, or constriction, of the aorta. Heart failure may result unless the constricted area is repaired by surgery.

Hypertrophic cardiomyopathy (HCM) occurs in 1 out of every 600 people in the United States and is the most common cause of sudden death among athletes younger than age 35. It causes the heart muscle to become hypertrophic (enlarged), primarily in the septum, which is the area between the two ventricles. People with hypertrophic cardiomyopathy are at high risk for sudden death, mainly due to serious arrhythmias. Hypertrophic cardiomyopathy may be identified by a **murmur** and diagnosed using echocardiography. Possible treatments include medication and a pacemaker or an internal defibrillator. If the hypertrophy is mainly in the septum, some of the septum can be surgically removed or a nonsurgical procedure can be done to kill off the extra muscle.

peripheral arterial disease (PAD) Atherosclerosis in the arteries in the legs (or less commonly, the arms) that can impede blood flow and lead to pain, infection, and loss of the affected limb.

pulmonary edema The accumulation of fluid in the lungs.

congestive heart failure A condition resulting from the heart's inability to pump enough blood to keep up with the body's metabolic needs: blood backs up in the veins leading to the heart, causing an accumulation of fluid in various parts of the body.

congenital heart defect A defect or malformation of the heart or its major blood vessels, present at birth.

hypertrophic cardiomyopathy (HCM) An inherited condition in which there is an enlargement of the heart muscle, especially the muscle between the two ventricles.

murmur An abnormal heart sound indicating turbulent blood flow through a valve or hole in the heart.

TERMS

Rheumatic Heart Disease Rheumatic fever, a consequence of certain types of untreated streptococcal throat infections, is a leading cause of heart trouble worldwide. Rheumatic fever can permanently damage the heart muscle and heart valves, a condition called *rheumatic heart disease (RHD)*. Many of the approximately 100,000 operations on heart valves performed annually are related to RHD, and about 3,300 Americans die each year from RHD. The incidence of rheumatic fever has declined significantly in the United States since the introduction of antibiotics.

Symptoms of strep throat include the sudden onset of a sore throat, painful swallowing, fever, swollen glands, headache, nausea, and vomiting. Careful laboratory diagnosis is important because strep throat is treated with antibiotics, which are not useful in the treatment of far more common viral sore throats. If left untreated, up to 3% of strep infections progress into rheumatic fever. Rheumatic fever affects primarily children between the ages of 5 and 15.

Heart Valve Disorders Age, previous heart attacks, congenital defects, and certain types of infections can cause abnormalities in the valves between the chambers of the heart. Heart valve problems generally fall into two categories—the valve fails to open fully, or it fails to close completely. In either case, blood flow through the heart is impaired.

Treatment for heart valve disorders depends on their location and severity. Serious problems may be treated with surgery to repair or replace a valve. People with certain types of heart valve defects are advised to take antibiotics prior to some types of dental and surgical procedures in order to prevent bacteria, which may be dislodged into the bloodstream during the procedure, from infecting the defective valve.

The most common heart valve disorder is **mitral valve prolapse (MVP)**, which occurs in about 3% of the population. MVP is characterized by a billowing of the mitral valve, which separates the left ventricle and left atrium, during ventricular contraction. In some cases, blood leaks from the ventricle into the atrium. Most people with MVP have no symptoms: they have the same ability to exercise and live as long as people without MVP. The condition is often diagnosed during a routine medical exam when an extra heart sound (a click) or murmur is heard. The diagnosis can be confirmed with echocardiography.

PROTECTING YOURSELF AGAINST CARDIOVASCULAR DISEASE

There are several important steps you can take now to lower your risk of developing CVD (Figure 15.6). CVD can begin very early in life. For example, fatty streaks (very early atherosclerosis) can be seen on the aorta in children younger than age 10. Also, young adults with relatively low cholesterol levels go on to live substantially longer than those with higher levels. Reducing CVD risk factors when you are young can pay off with many extra years of life and health (see the box “Are You at Risk for CVD?”).

QUICK STATS

Only 19% of Americans with hypertension follow the DASH diet.

—American Heart Association, 2010

Eat Heart-Healthy

For most Americans, eating a heart-healthy diet involves many of the changes suggested in the Dietary Guidelines for Americans. See Chapter 12 for a detailed discussion of

nutrition and dietary guidelines. The following aspects of nutrition apply directly to heart health:

- *Decrease fat and cholesterol intake.*
- *Eat a high-fiber diet.*
- *Reduce sodium intake and increase potassium intake.*
- *Avoid excessive alcohol consumption.*
- *Eat foods rich in omega-3 fatty acids.*

In addition to these familiar guidelines, a few specifics pertain to heart health:

- **Plant stanols and sterols.** Plant stanols and sterols, found in some types of trans-fat-free margarines and other products, reduce the absorption of cholesterol in the body and help lower LDL levels. For people with high LDL levels that do not respond to changes in fat intake, the NCEP suggests an intake of 2 grams per day of plant stanols or sterols.
- **Folic acid, vitamin B-6, and vitamin B-12.** These vitamins lower homocysteine levels, and folic acid has also been found to reduce the risk of hypertension.
- **Calcium.** Diets rich in calcium may help prevent hypertension and possibly stroke by reducing insulin resistance and platelet aggregation. Good sources of calcium are low-fat and fat-free dairy products.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Has anyone you know ever had a heart attack? If so, was the onset gradual or sudden? Were appropriate steps taken to help the person (for example, did anyone call 911, give CPR, or use an AED)? Do you feel comfortable dealing with a cardiac emergency? If not, what can you do to improve your readiness?

TERMS

rheumatic fever A disease, mainly of children, characterized by fever, inflammation, and pain in the joints. It often damages the heart valves and muscle, a condition called rheumatic heart disease.

mitral valve prolapse (MVP) A condition in which the mitral valve billows out during ventricular contraction, allowing leakage of blood from the left ventricle into the left atrium.

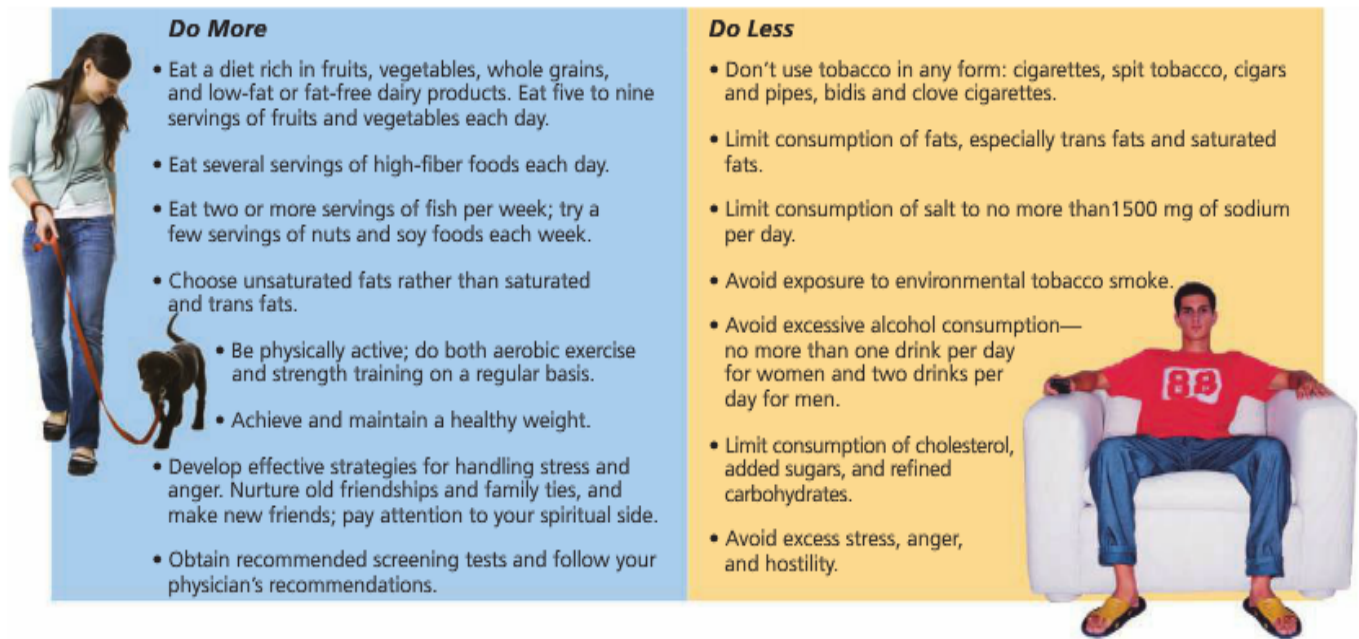


FIGURE 15.6 Strategies for reducing your risk of cardiovascular disease.

- **Soy protein.** Although soy itself doesn't seem to have much effect on cholesterol, replacing some animal proteins with soy protein (such as tofu) may help lower LDL cholesterol.

- **Healthy carbohydrates.** Healthy carbohydrate choices include whole grains, fruits, and nonstarchy vegetables. Healthy carbohydrates are important for people with insulin resistance, prediabetes, or diabetes.

- **Total calories.** Some studies have found that reducing energy intake can improve cholesterol and triglyceride levels as much as reducing fat intake does. Reduced calorie intake also helps control body weight—an extremely important risk factor for CVD.

Most experts recommend against taking nutritional supplements (especially extra folic acid and B vitamins) as a way to prevent heart disease. In fact, a 10-year-long study revealed that vitamin C and E supplements provided no protection against heart disease in men. In some of the study's subjects, vitamin E supplementation was associated with an increased risk of stroke. An estimated 12% of Americans take vitamin C and E supplements, and many people do so because of a long-standing yet unproven theory that these antioxidants protect against heart disease. There is some evidence that vitamin D deficiency may increase the risk of heart disease, especially in men, but experts do not currently advise taking vitamin D supplements to prevent CVD. If you are concerned about your heart health and think you may not be getting the nutrition you need, ask your physician or a registered dietitian for advice.

A diet plan that reflects many of the recommendations described here was released as part of a study called Dietary Approaches to Stop Hypertension, or DASH. The DASH study found that a diet low in fat and high in fruits, vegetables, and low-fat dairy products reduces blood pressure. It

also follows the recommendations for lowering the risk of heart disease, cancer, and osteoporosis. See Chapter 12 for details about the DASH diet plan, including specific serving information for people with different caloric needs.

Exercise Regularly

You can significantly reduce your risk of CVD with a moderate amount of physical activity. Follow the guidelines for physical activity and exercise described in Chapter 13. In addition to aerobic exercise for building and maintaining cardiovascular health, strength training helps reduce body fat and improves lipid levels and glucose metabolism.

The more exercise you get, the less likely you are to develop or die from CVD. Compared to sedentary individuals, people who engage in regular, moderate physical activity lower their risk of CVD by 20% or more. People who get regular, vigorous exercise reduce their risk of CVD by 30% or more. This positive benefit applies regardless of gender, age, race, or ethnicity.

The type of exercise performed is less important than the amount of energy expended during the activity. The greater the energy expenditure, the greater the health benefits. Exercise affects heart health via many mechanisms: it helps people lose weight and improve body composition. Weight loss can improve heart health by reducing the amount of stress on the heart. Changing body composition to a more positive ratio of fat to fat-free mass boosts resting metabolic rate. Exercise can also prevent metabolic syndrome and reverse many of its negative effects on the body. Exercise directly strengthens the heart muscle itself, and it improves the balance of fats in the blood by boosting HDL and reducing LDL and triglyceride levels.

One of the clearest positive effects of exercise is on hypertension. Many studies, involving thousands of people, have



ASSESS YOURSELF

Are You at Risk for CVD?

Your chances of suffering an early heart attack or stroke depend on a variety of factors, many of which are under your control. You can significantly affect your future health and quality of life if you adopt healthy behaviors when you are young. To help identify your risk factors, circle the response for each risk category that best describes you:

1. Gender and age:
 - 0 Female age 55 or younger, or male age 45 or younger
 - 2 Female age 55 or older, or male age 45 or older
 - 3 45–54
 - 5 35–44
 - 7 25–34
 - 12 Lower than 25
2. Heredity:
 - 0 Neither parent suffered a heart attack or stroke before age 60
 - 3 One parent suffered a heart attack or stroke before age 60
 - 7 Both parents suffered a heart attack or stroke before age 60
3. Smoking:
 - 0 Never smoked
 - 3 Quit more than two years ago, and lifetime smoking is less than five pack-years*
 - 6 Quit less than two years ago, and/or lifetime smoking is greater than five pack-years*
 - 8 Smoke less than half a pack per day
 - 13 Smoke more than half a pack per day
 - 15 Smoke more than one pack per day
4. Environmental tobacco smoke:
 - 0 Do not live or work with smokers
 - 2 Exposed to ETS at work
 - 3 Live with a smoker
 - 4 Both live and work with smokers
5. Blood pressure—if available, average your last three readings:
 - 0 120/80 or below
 - 1 121/81–130/85
 - 3 Don't know
 - 5 131/86–150/90
 - 9 151/91–170/100
 - 13 Above 170/100
6. Total cholesterol (mg/dl):
 - 0 Lower than 190
 - 1 190–210
 - 2 Don't know
 - 3 211–240
 - 4 241–270
 - 5 271–300
 - 6 Over 300
7. HDL cholesterol (mg/dl):
 - 0 Over 60
 - 1 55–60
 - 2 Don't know
8. Exercise:
 - 0 Exercise three times a week
 - 1 Exercise once or twice a week
 - 2 Occasional exercise less than once a week
 - 7 Rarely exercise
9. Diabetes:
 - 0 No personal or family history
 - 2 One parent with diabetes
 - 6 Two parents with diabetes
 - 9 Non–insulin-dependent diabetes
 - 13 Insulin-dependent diabetes
10. Body mass index (using the formula provided in Chapter 14):
 - 0 <23.0
 - 1 23.0–24.9
 - 2 25.0–28.9
 - 3 29.0–34.9
 - 5 35.0–39.9
 - 7 ≥40
11. Stress:
 - 0 Relaxed most of the time
 - 1 Occasional stress and anger
 - 2 Frequently stressed and angry
 - 3 Usually stressed and angry

Scoring

Total your risk factor points. Refer to the following below to get an approximate rating of your risk of suffering an early heart attack or stroke.

Score	Estimated Risk
Less than 20	Low risk
20–29	Moderate risk
30–45	High risk
Over 45	Extremely high risk

*Pack-years can be calculated by multiplying the number of packs you smoked per day by the number of years you smoked. For example, if you smoked a pack and a half a day for five years, you would have smoked the equivalent of $1.5 \times 5 = 7.5$ pack-years.

shown that physical activity reduces both systolic and diastolic blood pressure. These studies showed that people who did regular aerobic exercise lowered their resting blood pressure by 2–4% on average. Lowered blood pressure itself reduces the risk of other kinds of cardiovascular disease.

Avoid Tobacco

The number-one risk factor for CVD that you can control is smoking. If you smoke, quit. If you don't, don't start. If you live or work with people who smoke, encourage them to quit—for their sake and yours. Exposure to environmental tobacco smoke raises your risk of CVD, and there is no safe level of exposure. If you find yourself breathing in smoke, take steps to prevent or stop the exposure. See Chapter 11 for detailed information about the effects of smoking and strategies for quitting.

Know and Manage Your Blood Pressure

If you have no CVD risk factors, have your blood pressure measured by a trained professional at least once every two years. Yearly tests are recommended if you have risk factors. If your blood pressure is high, follow your physician's advice on how to lower it. For those with hypertension that is not readily controlled with lifestyle changes, an array of anti-hypertension medications are available.

Know and Manage Your Cholesterol Levels

All people aged 20 and over should have their cholesterol checked at least once every five years. The NCEP recommends a fasting lipoprotein profile that measures total cholesterol, HDL, LDL, and triglyceride levels. Once you know your baseline numbers, you and your physician can develop an LDL goal and lifestyle plan.

Develop Effective Ways to Handle Stress and Anger

To reduce the psychological and social risk factors for CVD, develop effective strategies for handling the stress in

your life. Shore up your social support network, and try some of the techniques described in Chapter 2 for managing stress.

TIPS FOR TODAY AND THE FUTURE

Because cardiovascular disease is a long-term process that can begin when you're young, it's important to develop heart-healthy habits early in life.

RIGHT NOW YOU CAN:

- Make an appointment to have your blood pressure and cholesterol levels checked.
- List the key stressors in your life, and decide what to do about the ones that bother you most.
- Plan to replace one high-fat item in your diet with one that is high in fiber. For example, replace a doughnut with a bowl of whole-grain cereal.

IN THE FUTURE YOU CAN:

- Track your eating habits for one week, then compare them to the DASH eating plan. Make adjustments to bring your diet closer to the DASH recommendations.
- Sign up for a class in cardiopulmonary resuscitation (CPR). A CPR certification equips you with valuable lifesaving skills you can use to help someone who is choking, having a heart attack, or experiencing cardiac arrest.

connect™

Connect to Your Choices

Have you ever thought about where you get your behaviors and habits related to the health of your heart and cardiovascular system? Many factors can influence our behaviors and habits, some not as obvious as others. When you were growing up, did your family avoid risk-increasing behaviors like smoking and being physically inactive? Currently do you live on a campus or in a community where smoking is discouraged and physical activity is encouraged? Does your health clinic offer programs to help smokers quit or to promote and facilitate physical activity? Does your clinic offer free blood pressure and cholesterol checks?

What are the external factors that influence your choices about heart health–related behaviors and choices? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know what your blood pressure and cholesterol levels are? If not, is there a reason you don't know? Is something preventing you from getting this information about yourself? How can you motivate yourself to have these easy but important health checks?

SUMMARY

- The cardiovascular system circulates blood throughout the body. The heart pumps blood to the lungs via the pulmonary artery and to the body via the aorta.
- The exchange of nutrients and waste products takes place between the capillaries and the tissues.
- The six major risk factors for CVD that can be changed or controlled are smoking, high blood pressure, unhealthy cholesterol levels, inactivity, overweight and obesity, and diabetes.
- Effects of smoking include lower HDL levels, increased blood pressure and heart rate, accelerated plaque formation, and increased risk of blood clots.
- Hypertension occurs when blood pressure exceeds normal levels most of the time. It weakens the heart, scars and hardens arteries, and can damage the eyes and kidneys.
- High LDL and low HDL cholesterol levels contribute to clogged arteries and increase the risk of CVD.
- Physical inactivity, obesity, and diabetes are interrelated and are associated with high blood pressure and unhealthy cholesterol levels.
- Contributing risk factors that can be changed include high triglyceride levels and psychological and social factors.
- Risk factors for CVD that can't be changed include being over 65, being male, being African American, and having a family history of CVD.
- Atherosclerosis is a progressive hardening and narrowing of arteries that can lead to restricted blood flow and even complete blockage.
- Heart attacks are usually the result of a long-term disease process. Warning signs of a heart attack include chest discomfort, shortness of breath, nausea, and sweating.
- A stroke occurs when the blood supply to the brain is cut off by a blood clot or hemorrhage. A transient ischemic attack (TIA) may be a warning sign of an impending stroke.
- Congestive heart failure occurs when the heart's pumping action becomes less efficient and fluid collects in the lungs or in other parts of the body.
- Dietary changes that can protect against CVD include decreasing your intake of fat, especially saturated and trans fats, and cholesterol, and increasing your intake of fiber by eating more fruits, vegetables, and whole grains.
- CVD risk can also be reduced by exercising regularly, avoiding tobacco and environmental tobacco smoke, knowing and managing your blood pressure and cholesterol levels, and developing effective ways of handling stress and anger.

FOR MORE INFORMATION

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Mostyn, B. 2007. *Pocket Guide to Low Sodium Foods*, 2nd ed. Olympia, WA: InData Publishing. Lists thousands of low-sodium products that can be purchased in supermarkets, as well as low-sodium choices available in many restaurants.

ORGANIZATIONS, HOTLINES, AND WEBSITES

American Heart Association. Provides information about hundreds of topics relating to cardiovascular disease; the AHA's website links to several sites focusing on specific heart-related topics.

<http://www.heart.org> (general information)

Dietary Approaches to Stop Hypertension (DASH). Provides information about the design, diets, and results of the DASH study, including tips on how to follow the DASH diet at home.

<http://www.nhlbi.nih.gov/health/public/heart/hbp/dash>

The Human Heart: An On-Line Exploration. An online museum exhibit containing information about the structure and function of the heart, how to monitor your heart's health, and how to maintain a healthy heart.

<http://www.fi.edu/learn/heart/index.html>

MedlinePlus: Blood, Heart, and Circulation Topics. Provides links to reliable sources of information on many topics relating to cardiovascular health.

<http://www.nlm.nih.gov/medlineplus/bloodheartandcirculation.html>

National Cholesterol Education Program (NCEP): Cholesterol Counts for Everyone. Provides information about cholesterol for people with heart disease and people who want to avoid it.

<http://www.nhlbi.nih.gov/about/ncep/index.htm>

National Heart, Lung, and Blood Institute. Provides information about and interactive applications for a variety of topics relating to cardiovascular health and disease, including cholesterol, smoking, obesity, hypertension, and the DASH diet.

<http://http://www.nhlbi.nih.gov/>

National Stroke Association. Provides information and referrals for stroke victims and their families as well as a stroke risk assessment.

<http://www.stroke.org>

See also the listings for Chapters 2, 3, and 12–14.

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BEHAVIOR CHANGE STRATEGY

Reducing the Saturated and Trans Fats in Your Diet

The American Heart Association recommends that no more than 7% of the calories in your diet come from saturated fats and no more than 1% from trans fats. Similarly, the report of the 2010 Dietary Guidelines Advisory Committee recommends that Americans limit saturated fat intake to no more than 7% of daily calories and that they avoid trans fat from industrial sources completely and consume only small amounts (less than 0.5% of calories) of trans fat from natural sources. Foods high in saturated fat include red meat, poultry skin, full-fat dairy products, coconut and palm oils, and hydrogenated vegetable oils. Hydrogenated fats, products made with them, and deep-fried fast food are high in trans fats. Although food manufacturers are phasing out trans fats, it's important to read labels to see how much trans fat a product contains. If a product contains less than 0.5% trans fat, the manufacturer is allowed to list trans fat content as 0%.

Monitor Your Current Diet

To see how your diet measures up, keep track of everything you eat for three days in your health journal. Information about the calorie and saturated fat and trans fat

content of foods is available on many food labels, in books, and on the Internet.

At the end of the monitoring period, write in the calories and grams of saturated and trans fat for the foods you've eaten. Determine the percentage of daily calories as fat that you consumed for each day: multiply grams of saturated and trans fats by 9 (fat has 9 calories per gram) and then divide by total calories. For example, if you consumed 30 grams of saturated and trans fats and 2100 calories on a particular day, then your saturated and trans fat consumption as a percentage of total calories would be calculated as $30 \times 9 = 270$ calories of fat $\div$ 2100 total calories = 0.13, or 13%. If you have trouble obtaining all the data you need to do the calculations, you can still estimate whether your diet is high in saturated and trans fats by seeing how many servings of foods high in unhealthy fats you typically consume on a daily basis.

Making Healthy Changes

To reduce your intake of unhealthy fats, you may want to set a limit on the number of servings of foods high in saturated and trans fats that you have each day. Or you may want to set a more precise goal and

then continue to monitor your daily consumption. The 7% limit set by the American Heart Association corresponds to 12 grams of saturated fats in a 1600-calorie diet, 17 grams in a 2200-calorie diet, and 22 grams in a 2800-calorie diet.

To plan healthy changes, take a close look at your food record. Do you choose many foods high in saturated fats? Do you limit your portion sizes to those recommended by MyPlate? Try making healthy substitutions. Instead of a grilled cheese sandwich, try turkey, or substitute a plain baked potato for french fries. If you frequently eat in fast-food restaurants, try finding an appealing alternative—and recruit some friends to join you.

When you choose foods that are rich in saturated fats, *watch your portion sizes carefully*. Choose cuts of meat that have the least amount of visible fat, and trim off what you see. And try to balance your choices throughout the day. For example, if your lunch includes a hamburger and fries, choose a vegetarian pasta dish for dinner. Plan your diet around a variety of whole grains, vegetables, legumes, and fruits, which are nearly always low in fats and high in nutrients. See Chapter 12 for more details about a heart-healthy diet and for a list of alternatives to some popular foods.

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Cancer



LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain what cancer is and how it spreads
- List and describe common cancers—their risk factors, signs and symptoms, and treatments, and approaches to prevention
- Discuss some of the causes of cancer and how they can be avoided or minimized
- Describe how cancer can be detected, diagnosed, and treated
- List specific actions you can take to lower your risk of cancer

TEST YOUR KNOWLEDGE

1. Which type of cancer kills the most women each year?
 - a. Breast cancer
 - b. Lung cancer
 - c. Ovarian cancer
2. Which type of cancer kills the most men each year?
 - a. Prostate cancer
 - b. Lung cancer
 - c. Colon cancer
3. Testicular cancer is the most common cancer in men under age 30. True or false?
4. The use of condoms during sexual intercourse can prevent cervical cancer in women. True or false?
5. Eating which of these foods may help prevent cancer?
 - a. Chili peppers
 - b. Broccoli
 - c. Oranges

Cancer is the second leading cause of death, after heart disease. In the United States, cancer is responsible for nearly one in four deaths, claiming over 570,000 lives annually—more than 1500 each day. More than 1.5 million new cancer cases were diagnosed in 2012.

Even as medical science struggles to find a cure for cancer, mounting evidence indicates that many cancers could be prevented by simple changes in lifestyle. Tobacco use, for example, is responsible for about 30% of all cancer deaths (Figure 16.1). Poor dietary and exercise habits, and their relationship with obesity, account for another 30% of cancer deaths. Cancers caused by infectious agents such as hepatitis B virus, human papillomavirus, human immunodeficiency virus, and *Helicobacter pylori* could be prevented by lifestyle changes, vaccination, or treatment of the infections. Additionally, many skin cancers could be prevented by avoiding excessive sunlight

exposure and tanning. Such evidence indicates that individual behavior is a significant determinant of cancer risk.

This chapter introduces you to cancer, explains how the disease progresses, and identifies the factors that put people at risk for developing cancer. The following sections also discuss the lifestyle factors that can help you reduce your risk for cancer.

WHAT IS CANCER?

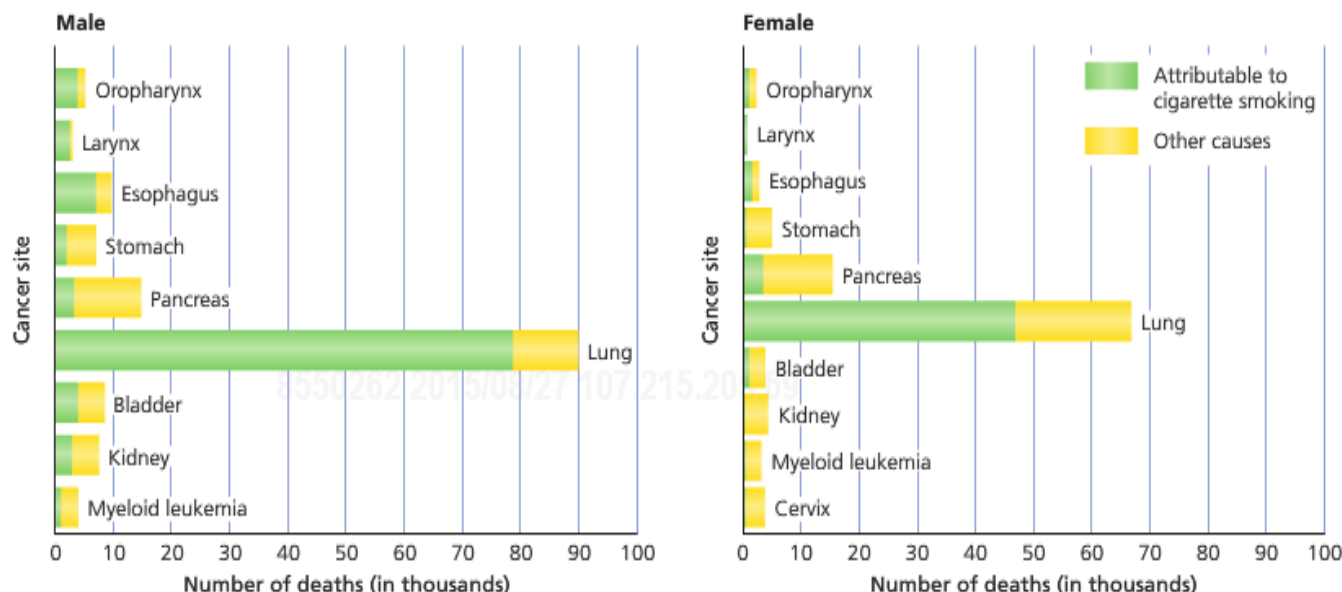
Cancer is the abnormal, uncontrolled multiplication of cells, which can ultimately cause death if left untreated.

Tumors

Most cancers take the form of tumors, although not all tumors are cancerous. A **tumor** (or *neoplasm*) is a mass of tissue

ANSWERS

1. **B.** There are more cases of breast cancer each year, but lung cancer kills more women. Smoking is the primary risk factor for lung cancer.
2. **B.** There are more cases of prostate cancer, but lung cancer kills about three times as many men as prostate cancer does each year.
3. **TRUE.** Although rare, testicular cancer is the most common cancer in men under age 30. Regular self-exams may aid in its detection.
4. **TRUE.** The primary cause of cervical cancer is infection with human papillomavirus (HPV), a sexually transmitted pathogen. The use of condoms helps prevent HPV infection.
5. **ALL THREE.** These and many other fruits and vegetables are rich in phytochemicals, which are naturally occurring substances that may have anti-cancer effects.



VITAL STATISTICS

FIGURE 16.1 Annual Number of Cancer Deaths Attributable to Smoking.

SOURCE: American Cancer Society. 2011. *Cancer Prevention and Early Detection Facts & Figures*. Atlanta: American Cancer Society. Reprinted by the permission of the American Cancer Society, Inc. from www.cancer.org. All rights reserved.

that serves no physiological purpose. It can be benign, like a wart, or malignant, like most lung cancers.

Benign (noncancerous) **tumors** are made up of cells similar to the surrounding normal cells and are enclosed in a membrane that prevents them from penetrating neighboring tissues. They are dangerous only if their physical presence interferes with body functions. A benign brain tumor, for example, can cause death if it blocks the blood supply to the brain.

The term **malignant tumor** is synonymous with cancer. A malignant tumor can invade surrounding structures, including blood vessels, the **lymphatic system**, and nerves. It can also spread to distant sites via the blood and lymphatic circulation, producing invasive tumors in almost any part of the body. A few cancers, like leukemia (cancer of the blood), do not produce a mass but still have the fundamental property of rapid, uncontrolled cell proliferation. For this reason, such diseases are malignant and are considered to be a form of cancer.

Cancer begins when a change (or mutation) in a cell occurs that allows the cell to grow and divide when it should not. Normally (in adults) cells multiply at a rate just sufficient to replace dying cells. In contrast, a malignant cell divides into new cells without regard for normal control mechanisms and gradually produces a mass of abnormal cells, or a tumor. A pea-sized mass is made up of about a billion cells, so a single tumor cell must go through many divisions, often taking years, before the tumor grows to a noticeable size (Figure 16.2).

Eventually a tumor becomes large enough to cause symptoms or to be directly detected. In the breast, for example, a tumor may be felt as a lump or diagnosed as cancer by an X-ray or **biopsy**. In less accessible locations, like the lung, a tumor may be noticed only after it has grown considerably and may then be detected only by an indirect symptom, such

as a persistent cough or unexplained bleeding. In the case of leukemia, changes in the blood are eventually noticed as increasing fatigue, infection, or abnormal bleeding.

Metastasis

Metastasis is the spread of cancer cells from one part of the body to another. Metastasis occurs because cancer cells do not stick to each other as strongly as normal cells do and therefore may move away from the site of the *primary tumor* (the cancer's original location). After cancer cells break away, they can pass through the lining of lymph or blood vessels to invade nearby tissue. Once established, a tumor can recruit

cancer The abnormal, uncontrolled multiplication of cells.

tumor A mass of tissue that serves no physiological purpose; also called a *neoplasm*.

benign tumor A tumor that is not cancerous.

malignant tumor A tumor that is capable of spreading and thus is cancerous.

lymphatic system A system of vessels that returns proteins, lipids, and other substances from fluid in the tissues to the circulatory system.

biopsy The removal of a small piece of body tissue; a needle biopsy uses a needle to remove a small sample of tissue, but some biopsies require surgery.

metastasis The spread of cancer cells from one part of the body to another.

TERMS

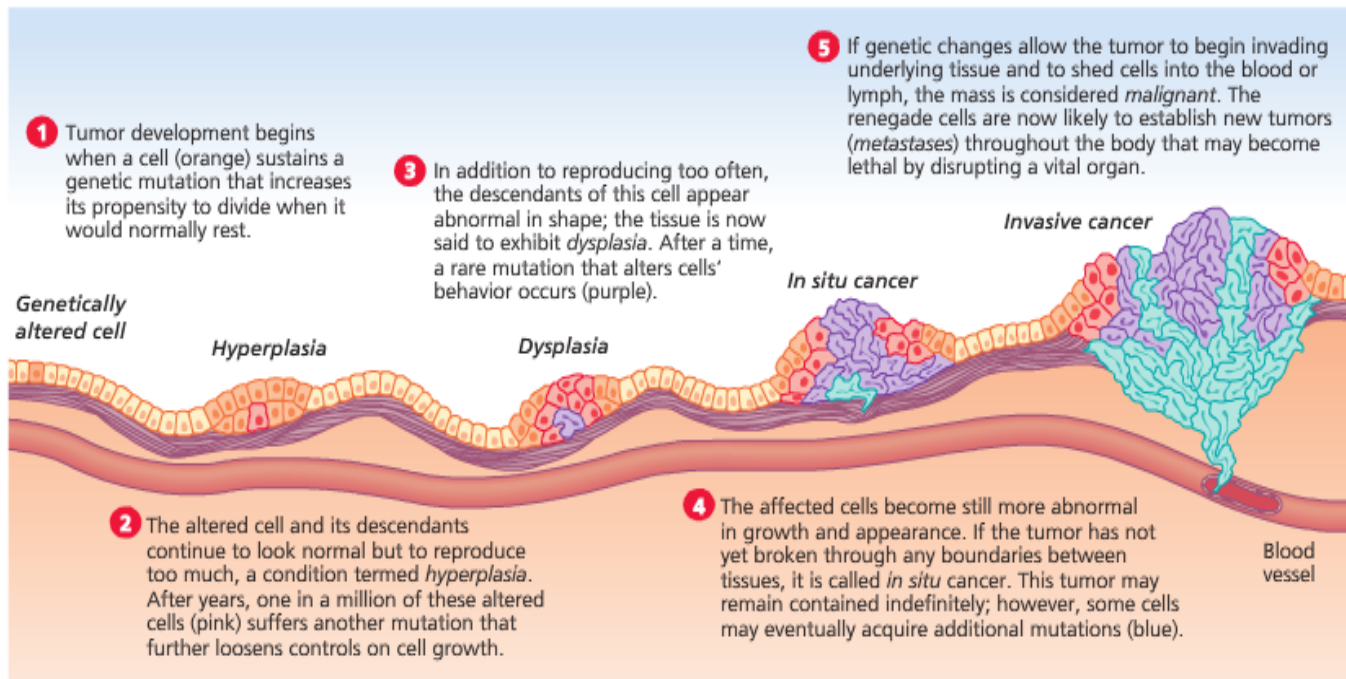


FIGURE 16.2 Tumor development occurs in stages.

SOURCE: Illustration by Dana Burns-Pizer, from Weinberg, R.A. "How cancer arises." *Scientific American*, September, 1996. Reprinted by permission.

normal cells (such as bone marrow cells), modify them, and use them as "envoys" to travel to different parts of the body and prepare other sites to receive traveling cancer cells. The envoy cells work by creating proteins that attract the free-floating cancer cells, allowing them to gather at a new site and resume making copies of themselves. This traveling and seeding process is called *metastasizing*, and the new tumors are called *secondary tumors* or *metastases*.

The ability of cancer cells to metastasize makes early cancer detection critical. To control the cancer, every cancerous cell must be removed. Once cancer cells enter either the lymphatic system or the bloodstream, it is extremely difficult to stop their spread to other organs of the body. In fact, counting the number of lymph nodes that contain cancer cells is one of the principal methods of predicting the outcome of the disease: the probability of a cure is much greater when the lymph nodes do not contain cancer cells.

The Stages of Cancer

Once a cancer has been diagnosed, physicians can classify the disease according to the extent of the cancer in the patient's body. This process is called **staging**, and the extent or spread of the cancer is described in five stages, as shown in Table 16.1.

To identify a cancer's stage, physicians assess the size or extent of the primary tumor, whether the cancer has invaded nearby lymph nodes, and whether metastases are present. By judging the extent of each criterion, physicians can determine the cancer's stage and choose the most appropriate treatment based on the extent of disease.

Table 16.1 Cancer Stages

STAGE	DESCRIPTION
0	Early cancer, present only in the layer of cells where it originated
I, II, III	More extensive cancer, with higher numbers indicating greater tumor size and/or the degree to which the cancer has spread to nearby lymph nodes or organs adjacent to the primary tumor
IV	Advanced cancer that has spread to another organ

SOURCE: U.S. National Institutes of Health, National Cancer Institute. 2004. *Staging: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/detection/staging>).

Remission

A significant number of cancer cases go into **remission**, which in some cases lasts for years. In remission, signs and symptoms of cancer disappear, and the disease is considered to be under control. Remission typically results from treatment, but some cancer patients enter remission spontaneously.

staging A method of classifying the extent of a cancer in a patient at the time of diagnosis.

remission A period during the course of cancer in which there are no symptoms or other evidence of disease.

TERMS

THE CAUSES OF CANCER

Although scientists do not know everything about what causes cancer, they have identified genetic, environmental, and lifestyle factors that increase the risk of developing cancer (see the box “Ethnicity, Poverty, and Cancer”).

The Role of DNA

Heredity and genetics are important factors in a person's risk of cancer. Certain genes may predispose some people to cancer, and specific genetic mutations have been associated with cancer.

DNA Basics The nucleus of each cell in your body contains 23 pairs of **chromosomes**, which are made up of tightly packed coils of **DNA** (deoxyribonucleic acid). DNA consists of two long strands wound around each other in a spiral structure, like a twisted ladder; scientists refer to this spiral as a *double helix*. The rungs of the ladder are made from four different nucleotide bases: adenine, thymine, cytosine, and guanine, or A, T, C, and G. The arrangement of nucleotide bases along the double helix constitutes the genetic code. You can think of this code as a set of instructions for building, operating, and repairing your body.

A **gene** is a smaller unit of DNA made up of a specific sequence of nucleotide bases. Each chromosome contains hundreds, and in some cases thousands, of genes; you have about 25,000 genes in all. Each of your genes controls the production of a particular protein. The makeup of each protein—which amino acids it contains and in what sequence—is determined by its precise sequence of A, T, C, and G. Proteins build cells and make them work: they serve both as the structural material for your body and as the regulators of all chemical reactions and metabolic processes. By making different proteins at different times, genes can act as switches to alter the ways a cell works.

Cells reproduce by dividing in two, and your body makes billions of new cells every day. When a cell divides, the DNA replicates itself so that each new cell has a complete set of chromosomes. Some genes are responsible for controlling the rate of cell division, and some types of cells divide much more rapidly than others. Genes that control the rate of cell division often play a critical role in the development of cancer.

DNA Mutations and Cancer A *mutation* is any change in the normal makeup of a gene. Some mutations are inherited. If the egg or sperm cell that produces a child contains a mutation, so will every one of the child's 30 trillion cells. Environmental agents can also produce mutational damage; these **mutagens** include radiation, certain viruses, and chemical substances in the air we breathe. (When a mutagen also causes cancer, it is called a *carcinogen*.) Some mutations are

the result of copying errors that occur when DNA replicates itself as part of cell division.

A mutated gene no longer contains the proper code for producing its protein. Because a cell has two copies of each gene, it can sometimes get by with only one functioning version. In this case, the mutation may have no effect on health. However, if both copies of a gene are damaged or if the cell needs two normal copies to function properly, then the cell will cease to behave normally.

It usually takes several mutational changes over a period of years before a normal cell takes on the properties of a cancer cell. Genes in which mutations are associated with the conversion of a normal cell into a cancer cell are known as **oncogenes**. In their undamaged form, many anti-oncogenes play a role in controlling or restricting cell growth; these are **tumor suppressor genes**. Mutational damage to these genes releases the brake on growth and leads to rapid and uncontrolled cell division—a precondition for the development of cancer.

A good example of how a series of mutational changes can produce cancer is provided by the p53 gene, located on chromosome 17. In its normal form, the protein that is coded for by this gene actually helps prevent cancer: if a cell's DNA is damaged, the p53 protein can either kill the cell outright or stop it from replicating until the damaged DNA is repaired. For example, if a skin cell's DNA is mutated by exposure to sunlight, the p53 protein activates the cell's “suicide” machinery. By preventing the replication of damaged DNA, the p53 protein keeps cells from progressing toward cancer. However, if the p53 gene itself undergoes a mutation, these controls are lost, and the cell can become cancerous. In fact, the damaged version of p53 can actually promote cell division and the spread of cancer. Researchers believe that damage to the p53 gene and protein may be involved, directly and indirectly, in as many as 50–60% of cancers of all types.

QUICK STATS

The overall cost of cancer in the United States is projected to reach at least \$158 billion in 2020.

—National Cancer Institute, 2011

chromosomes The threadlike bodies in a cell nucleus that contain molecules of DNA; most human cells contain 23 pairs of chromosomes.

DNA Deoxyribonucleic acid: a chemical substance that carries genetic information.

gene A section of a chromosome that contains the nucleotide base sequence for making a particular protein; the basic unit of heredity.

mutagen Any environmental factor that can cause mutation, such as radiation and atmospheric chemicals.

oncogene A gene involved in the transformation of a normal cell into a cancer cell.

tumor suppressor gene A gene that normally functions to restrain cellular growth; also called an anti-oncogene.

TERMS



DIVERSITY MATTERS

Ethnicity, Poverty, and Cancer

Rates of cancer have declined among all U.S. ethnic groups in recent years, but significant disparities still exist:

- Among U.S. ethnic groups, African Americans have the highest incidence of and death rates from cancer.
- White women have a higher incidence of breast cancer, but African American women have the highest breast cancer death rate. African American women are less likely to receive regular mammograms and more likely to experience delays in follow-up.
- African American men have a higher rate of prostate cancer than any other U.S. group and more than twice the prostate cancer death rate of other groups. African American men are less likely than white men to undergo PSA testing for prostate cancer.
- Latinas have the highest incidence of cervical cancer, but African American women have the highest cervical cancer death rate. Language barriers and problems accessing screening services are thought to particularly affect Latinas, who have relatively low rates of Pap testing.
- Asian Americans and Pacific Islander Americans have the highest rates of liver and stomach cancers. Recent immigration helps explain these higher rates because these cancers are usually caused by infections that are more prevalent in Asian countries of origin.

Some of the disparities in cancer risks and rates may be influenced by genetic or cul-

tural factors. For example, certain genetic/molecular features of aggressive breast cancer are more common among African American women with the disease, and these women are more likely to be diagnosed at a later stage and with more aggressive tumors. Genetic factors may also help explain the high rate of prostate cancer among black men. Women from cultures where early marriage and motherhood are common are likely to have a lower risk of breast cancer.

Most of the differences in cancer rates and deaths, however, are thought to be the result of socioeconomic inequities, which influence the prevalence of many underlying cancer risk factors as well as access to early detection and quality treatment. People of low socioeconomic status are more likely to smoke, abuse alcohol, eat unhealthful foods, and be sedentary and overweight—all factors associated with cancer. High levels of stress associated with poverty may impair the immune system, which is the body's first line of defense against cancer.

People with low incomes are more likely to live in unhealthful environments. Low-income people may also have jobs in which they come into daily contact with carcinogenic chemicals. They may face similar risks in their homes and schools, where they may be exposed to asbestos or other carcinogens.

People with low incomes also have less exposure to information about cancer, are less aware of the early warning signs of cancer, and are less likely to seek medical care when they have such symp-



toms. Lack of health insurance is a key factor explaining higher death rates among people with low incomes. Discrimination and language and cultural barriers can also affect patients' use of the health care system.

Public education campaigns that encourage healthy lifestyle habits, routine cancer screening, and participation in clinical trials may be one helpful strategy to reduce cancer disparities.

SOURCES: American Cancer Society. 2012. *Cancer Facts and Figures 2012*. Atlanta: American Cancer Society; Chlebowski, R. T., et al. 2005. Ethnicity and breast cancer: factors influencing differences in incidence and outcome. *Journal of the National Cancer Institute* 97(6): 439–448; CDC Office of Minority Health. 2006. *Eliminate Disparities in Cancer Screening and Management* (<http://www.cdc.gov/omhd/AMH/factsheets/cancer.htm>).

Hereditary Cancer Risks One way to obtain a mutated oncogene or tumor suppressor gene is to inherit it. The discovery of disease-related genes is opening up a host of issues related to genetic testing and associated legal, financial, and ethical concerns. Tests for hereditary mutations in breast cancer genes are now commercially available, but experts contend that not all women will benefit from such testing.

One example of an inherited genetic mutation associated with increased cancer risk is that involving the *BRCA* gene. Researchers identified *BRCA1* in 1994 and *BRCA2* in 1995. The overall prevalence of disease-related mutations in *BRCA1* is about 1 in 300, and 1 in 800 in *BRCA2*. In certain groups, most notably women of Ashkenazi (Eastern European)

Jewish descent, as many as 3 in 100 may carry an altered gene. Defects in these genes cause breast cancer in 50–80% of affected women. They also increase the risk of certain gynecological cancers.

Women with an altered *BRCA* gene tend to develop breast cancer at younger ages than other women, and the cancers that develop are more malignant. The situation is complex, however, because hundreds of different mutations of *BRCA1* and *BRCA2* have been identified, and not all of them carry the same risks.

Genetic analysis of DNA from a blood sample can identify mutant copies of *BRCA1* and *BRCA2*. However, only 5–10% of all breast cancers occur among women who inherit

an altered version of BRCA1 or BRCA2. A woman with a family history of breast cancer must still be monitored closely, even if she carries normal versions of BRCA1 and BRCA2; the cancer-causing genetic defect in her family could be located on another gene.

What about women who test positive for an altered copy of the gene? Options include close monitoring, drug treatment with a SERM (selective estrogen receptor modulator), such as tamoxifen, and prophylactic surgical removal of breasts and/or ovaries. As shown in several studies, prophylactic bilateral mastectomy decreases the risk of developing breast cancer by at least 90% in BRCA1/2 mutation carriers. When women with a BRCA1 or BRCA2 gene mutation have their ovaries and fallopian tubes removed as a preventive measure, their risk of breast cancer falls by approximately 50% and their risk of other gynecologic cancers falls by approximately 80%.

None of these strategies completely eliminates risk, and they may expose a woman to a dangerous or drastic treatment that is potentially unnecessary. The National Comprehensive Cancer Network developed specific risk assessment criteria that are recommended as part of the decision-making process in determining whether an individual should be considered for genetic testing. Some of these criteria include age of breast cancer diagnosis, presence of specific markers on breast cancer cells, presence of multiple breast cancers, diagnosis with other cancers, family history of cancers, and male breast cancer. Patients who warrant genetic testing should first be referred to a cancer genetics professional.

In most cases, however, mutational damage occurs after birth. Although some specific genes increase the risk of some cancers, many researchers say it is unlikely that science will identify genes that increase the risk of cancer in general. Lifestyle decisions are still important even for those who have inherited a damaged suppressor gene.

Cancer Promoters

Substances known as *cancer promoters* make up another important piece of the cancer puzzle. Carcinogenic agents such as UV radiation that cause mutational changes in the DNA of oncogenes are known as *cancer initiators*. *Cancer promoters*, on the other hand, don't directly produce DNA mutations. Instead they accelerate the growth of cells without damaging or permanently altering their DNA. However, a faster growth rate means less time for a cell to repair DNA damage caused by initiators, so errors are more likely to be passed on. Estrogen, which stimulates cellular growth in the female reproductive organs, is an example of a cancer promoter. Cigarette smoke is a complete carcinogen because it acts as both an initiator and a promoter.

Tobacco Use

Smoking is responsible for at least 80% of lung cancers and 30% of all cancer deaths. Overall, tobacco use is responsible for nearly one in five American deaths—approximately 443,000 premature deaths each year. The U.S. Surgeon General has reported that tobacco use is a direct cause of several

types of cancer. In addition to lung and bronchial cancer (discussed later in this chapter and in Chapter 11), tobacco use is linked to cancer of the larynx, mouth, pharynx, esophagus, stomach, pancreas, kidneys, bladder, and cervix. A direct causal relationship has also been established between tobacco use and acute myelogenous leukemia (AML).

Dietary Factors

Diet is one of the most important factors in cancer prevention, but it is also one of the most complex and controversial. The foods you eat contain many biologically active compounds, and your food choices affect your cancer risk by both exposing you to potentially dangerous compounds and depriving you of potentially protective ones (see Figure 16.3).

The following dietary factors may affect cancer risk:

- **Dietary fat and meat:** Diets high in fat and meat may contribute to certain cancers, including colon, stomach, and prostate cancer. Certain types of fats may be riskier than others. Omega-6 polyunsaturated fats are associated with a higher risk of certain cancers; omega-3 fats are not.
- **Alcohol:** Alcohol is associated with an increased incidence of several cancers. Women who have two to five drinks daily have about 1.5 times the cancer risk of women who drink no alcohol. Alcohol and tobacco interact as risk factors for oral cancer.
- **Fried foods:** High levels of the chemical acrylamide (a probable human carcinogen) are found in starch-based foods that have been fried or baked at high temperatures, especially french fries and certain types of snack chips and crackers. Acrylamide is also found in high concentrations in tobacco.
- **Fiber:** Various potential cancer-fighting actions have been proposed for fiber, but none of these actions has been firmly established. Further study is needed to clarify the relationship between fiber intake and cancer risk, but experts still recommend a high-fiber diet for its overall positive effect on health.
- **Fruits and vegetables:** Researchers have identified many mechanisms by which food components may act against cancer. Some may prevent carcinogens from forming in the first place or block them from reaching or acting on target cells. Others boost enzymes that detoxify carcinogens and render them harmless. Some essential nutrients act as **anticarcinogens**. For example, vitamin C, vitamin E, selenium, and the **carotenoids** (vitamin A precursors) may help block cancer by acting as antioxidants.

anticarcinogen An agent that destroys or otherwise blocks the action of carcinogens.

carotenoid Any of a group of yellow-to-red plant pigments that can be converted to vitamin A by the liver; many act as antioxidants or have other anti-cancer effects. The carotenoids include beta-carotene, lutein, lycopene, and zeaxanthin.

TERMS

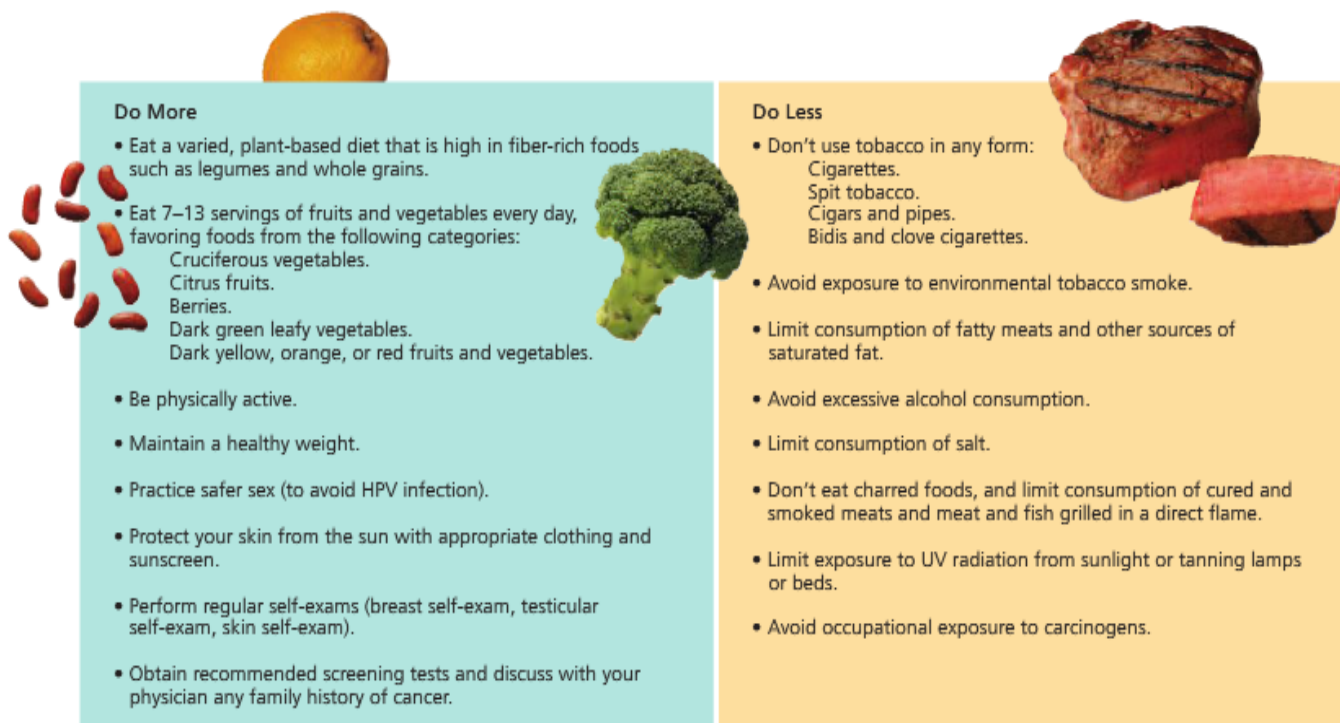


FIGURE 16.3 Strategies for reducing your risk of cancer.

Many other anti-cancer agents in the diet fall under the broader heading of **phytochemicals**, which are substances in plants that help protect against chronic diseases. One of the first to be identified was sulforaphane, a potent anticarcinogen found in broccoli. Sulforaphane induces the cells of the liver and kidney to produce higher levels of protective enzymes, which then neutralize dietary carcinogens. Most fruits and vegetables contain beneficial phytochemicals, and researchers are just beginning to identify them. Some of the most promising are listed in Table 16.2.

Inactivity and Obesity

The American Cancer Society (ACS) recommends maintaining a healthy weight throughout life by balancing caloric intake with physical activity, and by achieving and maintaining a healthy weight if you are currently overweight or obese. Being overweight or obese is linked with increased risk mortality from several kinds of cancer, including breast and colon cancer (Figure 16.4).

Lifestyle decisions are especially important for people with a genetic predisposition to a certain type of cancer.

phytochemical A naturally occurring substance found in plant foods that may help prevent chronic diseases such as cancer and heart disease; *phyto* means “plant.”

TERMS

Carcinogens in the Environment

Some carcinogens occur naturally in the environment, like viruses and the sun's UV rays. Others are manufactured or synthetic substances that show up occasionally in the general environment but more often in the work environments of specific industries. The ACS estimates that about 6% of cancer deaths stem from exposure to carcinogens in the environment—about 4% from occupational exposure and about 2% from exposure to naturally occurring or human-made pollutants in the larger environment.

Microbes It is estimated that about 15–20% of the world's cancers are caused by microbes, including viruses, bacteria, and parasites, although the percentage is much lower in developed countries like the United States. Certain types of human papillomavirus

are known to cause oropharyngeal cancer, cervical cancer, and other cancers, and the *Helicobacter pylori* bacterium has been linked to stomach cancer.

The Epstein-Barr virus, best known for causing mononucleosis, is also suspected of contributing to Hodgkin lymphoma, cancer of the nasopharynx, and some stomach cancers. Human herpes virus 8 has been linked to Kaposi's sarcoma and certain types of lymphoma. Hepatitis viruses B and C together cause as many as 80% of the world's liver cancers.

and commercial buildings. Asbestos was even used in special flame-retardant clothing for firefighters and factory workers. Asbestos use has been banned entirely in the European Union and is now highly restricted in the United States. When asbestos is uncovered in buildings, special abatement procedures must be taken to remove the material while protecting workers and surrounding areas. The human body is so sensitive to asbestos that inhaling even a few small asbestos fibers can result in lung damage, mesothelioma (a rare form of cancer caused almost exclusively by asbestos exposure), and lung cancer.

Carcinogens are encountered much more often in workplaces than in the home. Many of the chemicals, metals, and plastics used in industry are known or suspected carcinogens or cancer promoters. Ironically, many of the drugs used to treat cancer are known or suspected carcinogens, posing a risk of leukemia and other cancers to health care workers. Chemotherapy drugs can also cause skin rashes, infertility, miscarriage, and birth defects in people who work with or near these highly toxic substances. The National Institute for Occupational Safety and Health (NIOSH) publishes guidelines detailing proper procedures and equipment for handling these hazardous drugs. For all hazardous and potentially carcinogenic agents used throughout industry, more research is needed to determine which agents actually cause cancer and what level of exposure is dangerous.

With increasing industry and government regulation, we can anticipate that the industrial sources of cancer risk will continue to diminish, at least in the United States.

Radiation All sources of radiation are potentially carcinogenic, including medical X-rays, radioactive substances (radioisotopes), and UV rays from the sun. Successful efforts have been made to reduce the amount of radiation needed for mammograms, dental X-rays, and medical X-rays. Full-body CT scans are sometimes advertised for routine screening in otherwise well individuals in order to look for tumors. Such screening is not recommended; it is typically expensive and may have false positive findings that lead to additional tests, which may be unnecessary and invasive. Also, the radiation in these full-body X-rays may itself raise the risk of cancer; the radiation dose of one full-body CT scan is nearly 100 times that of a typical mammogram.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What do you think your risks for cancer are? Do you have a family history of cancer, or have you been exposed to carcinogens? How about your diet and exercise habits? What can you do to reduce your risks?

Sunlight is a very important source of radiation, but because its rays penetrate only a millimeter or so into the skin, it could be considered a surface carcinogen. Most cases of skin cancer are the relatively benign and highly curable basal cell carcinomas, but a substantial minority are the potentially deadly malignant melanomas. For a detailed discussion of environmental health—how the environment affects you and how you affect the environment—see Chapter 19.

DETECTING, DIAGNOSING, AND TREATING CANCER

Early cancer detection often depends on our willingness to be aware of changes in our own body and to make sure we keep up with recommended diagnostic tests. Although treatment success varies with individual cancers, cure rates have increased—sometimes dramatically—in this century.

Detecting Cancer

Unlike those of some other diseases, early signs of cancer are usually not apparent to anyone but the person who has them. Even pain is not a reliable guide to early detection because the initial stages of cancer may be painless. Self-monitoring is the first line of defense.

By being aware of the risk factors in your own life, your immediate family's cancer history, and your own history, you may bring a problem to the attention of a physician long before it would have been detected at a routine physical.

In addition to self-monitoring, the ACS recommends routine cancer checkups, as well as specific screening tests for certain cancers (Table 16.3).

Diagnosing Cancer

Detection of a cancer by physical examination is only the beginning. Methods for determining the exact location, type, and extent of a cancer continue to improve. Knowledge of the exact location and size of a tumor is necessary for precise and effective surgery and/or radiation therapy. This is especially true in cases where the tumor may be hard to reach, as in the brain.

Imaging studies or exploratory surgery may be performed to determine a cancer's stage. A biopsy may be performed to confirm the type of tumor. Several diagnostic imaging techniques have replaced exploratory surgery for some patients. Magnetic resonance imaging (MRI) uses a huge electromagnetic to detect hidden tumors by mapping, on a computer screen, the vibrations of different atoms in the body. Computed tomography (CT) scanning uses X-rays to examine the brain and other parts of the body. The process allows the construction of cross sections, which show a tumor's shape and location more accurately than possible with conventional X-rays. For patients undergoing radiation therapy, CT scanning

QUICK STATS

Worldwide,
7.6 million
people died of
cancer in 2008.

—World Health Organization, 2012

Table 16.3

Screening Guidelines for the Early Detection of Cancer in Average-Risk Asymptomatic People

CANCER SITE	POPULATION	TEST OR PROCEDURE	FREQUENCY
Breast	Women, age 20+	Breast self-examination	Beginning in their early 20s, women should be told about the benefits and limitations of breast self-examination (BSE). The importance of prompt reporting of any new breast symptoms to a health professional should be emphasized. Women who choose to do BSE should receive instruction and have their technique reviewed on the occasion of a periodic health examination. It is acceptable for women to choose not to do BSE or to do BSE irregularly.
		Clinical breast examination	For women in their 20s and 30s, it is recommended that clinical breast examination (CBE) be part of a periodic health examination, preferably at least every three years. Asymptomatic women aged 40 and over should continue to receive a clinical breast examination as part of a periodic health examination, preferably annually.
Colorectal [†]	Men and women, age 50+	Mammography	Begin annual mammography at age 40.*
		Tests that find polyps and cancer:	
		Flexible sigmoidoscopy [‡] , or	Every five years, starting at age 50
		Colonoscopy, or	Every 10 years, starting at age 50
		Double-contrast barium enema (DCBE) [‡] , or	Every five years, starting at age 50
		CT colonography (virtual colonoscopy) [‡]	Every five years, starting at age 50
Prostate	Men, age 50+	Tests that mainly find cancer:	Annual, starting at age 50
		Fecal occult blood test (FOBT) with at least 50% test sensitivity for cancer, or fecal immunochemical test (FIT) with at least 50% test sensitivity for cancer [‡] or	Annual starting at age 50. Testing at home with adherence to manufacturer's recommendation for collection techniques and number of samples is recommended. FOBT with a single stool sample collected on the clinician's fingertip during a digital rectal examination in the health care setting is not recommended. Guaiac-based toilet bowl FOBT tests also are not recommended. In comparison with guaiac-based tests for the detection of occult blood, immunochemical tests are more patient-friendly, and are likely to be equal or better in sensitivity and specificity. There is no justification for repeating FOBT in response to an initial positive finding.
		Stool DNA test (sDNA) [‡]	Interval uncertain, starting at age 50
Cervix	Women, age 21+	Pap test HPV DNA Test	Men who have at least a 10-year life expectancy should have an opportunity to make an informed decision with their health care provider about screening for prostate cancer after receiving information about the uncertainties, risks, and potential benefits associated with prostate cancer screening. Prostate cancer screening should not occur without an informed decision-making process.
Endometrial	Women, at menopause	At the time of menopause, women at average risk should be informed about risks and symptoms of endometrial cancer and strongly encouraged to report any unexpected bleeding or spotting to their physicians.	Cervical cancer screening should begin approximately three years after a woman begins having vaginal intercourse, but no later than 21 years of age. Screening should be done every year with conventional Pap tests or every two years using liquid-based Pap tests. At or after age 30, women who have had three normal test results in a row may get screened every two to three years with cervical cytology (either conventional or liquid-based Pap test) alone, or every three years with an HPV DNA test plus cervical cytology. Women 70 years of age and older who have had three or more normal Pap tests and no abnormal Pap tests in the past 10 years and women who have had a total hysterectomy may choose to stop cervical cancer screening.
Cancer-related checkup	Men and women, age 20+	During a periodic health examination, the cancer-related checkup should include examination for cancers of the thyroid, testicles, ovaries, lymph nodes, oral cavity, and skin, as well as health counseling about tobacco, sun exposure, diet and nutrition, risk factors, sexual practices, and environmental and occupational exposures.	

*Beginning at age 40, annual clinical breast examination should be performed prior to mammography.

[†]Individuals with a personal or family history of colorectal cancer or adenomas, inflammatory bowel disease, or high-risk genetic syndromes should continue to follow the most recent recommendations for individuals at increased or high risk.

[‡]Colonoscopy should be done if test results are positive.

SOURCE: American Cancer Society. Cancer Facts and Figures, 2010. Atlanta: American Cancer Society, Inc. Reprinted by the permission of the American Cancer Society, Inc., from www.cancer.org. All rights reserved.



CRITICAL CONSUMER

Avoiding Cancer Quackery

Sometimes conventional treatments for cancer are simply not enough. A patient may be told that conventional therapy can do little beyond easing pain. When therapy is available, it may be painful and even intolerable to some people. Not surprisingly, many cancer patients look for complementary and alternative therapies. As many as 80% of cancer patients report combining conventional treatments with some type of mind-body technique. A much smaller number of patients look for alternatives to the more conventional therapies. These may be therapies within the bounds of legitimate medical practice that have not yet proven themselves in clinical trials. Or at the extreme, alternative therapies may be scientifically unsound and dangerous, as well as expensive.

Complementary therapies such as yoga, massage, meditation, music therapy, t'ai chi, and prayer can have positive physical and psychological benefits for patients and help them improve their quality of life as they deal with illness and the often difficult treatments for cancer. Mind-body practices can reduce pain and anxiety, improve sleep, and give people a sense of control and participation in their treatment; such practices may also enhance the immune system. (See Chapter 2 for more about stress and relaxation techniques.) Mind-body practices typically can be used in combination with conventional cancer therapies.

For other types of therapies, the National Cancer Institute suggests that patients and their families consider the following questions when making decisions about cancer treatment:

- *Has the treatment been evaluated in clinical trials?* Advances in cancer treatment are made through carefully monitored clinical trials. If a patient wants to try a new therapy, participation in a clinical trial may be a treatment option.
- *Do the practitioners of an approach claim that the medical community is trying to keep their cure from the public?* No one genuinely committed to finding better ways to treat a disease would

knowingly keep an effective treatment secret or try to suppress such a treatment.

- *Does the treatment rely on nutritional or diet therapy as its main focus?* Although diet can be a key risk factor in the development of cancer, there is no evidence that diet alone can get rid of cancerous cells in the body.
- *Do those who endorse the treatment claim that it is harmless and painless and that it produces no unpleasant side effects?* Reputable researchers are working to develop less toxic cancer therapies, but because effective treatments for cancer must be powerful, they frequently have unpleasant side effects.
- *Does the treatment have a secret formula that only a small group of practitioners can use?* Scientists who believe they have developed an effective treatment routinely publish their results in reputable journals so they can be evaluated by other researchers.

Use special caution when evaluating cancer remedies promoted online; a recent study found that as many as one-third of cancer-related alternative medicine sites offered advice that was harmful or potentially dangerous.

One danger of alternative medicine is the very real possibility that proven therapies will be neglected while unproven, faddish alternative approaches are pursued; if alternative therapies delay proven therapies, lives may be lost. Another danger is that complementary therapies may counteract or affect conventional therapies; for example, some herbal supplements have been found to affect how cancer drugs are absorbed and used by the body. Further, some of these alternative therapies are expensive, and many patients are concerned about the cost of unproven therapies. A recent study revealed that 70% of patients using complementary therapies do not inform their physicians. However, it is essential for physicians to have this information so any side effects or harmful interactions can be prevented.

SOURCES: American Cancer Society. 2011. *Complementary and Alternative Therapies for Cancer Management* (<http://www.cancer.org/Treatment/TreatmentsandSideEffects/ComplementaryandAlternativeMedicine/complementary-and-alternative-methods-for-cancer-management>); National Cancer Institute. 2011. *Complementary and Alternative Medicine* (<http://www.cancer.gov/cancertopics/cam>).

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enables the therapist to pinpoint the tumor more precisely, thereby providing more accurate radiation dosage to the tumor while sparing normal tissue.

Ultrasonography is also used to view tumors. It has several advantages: it can be used in the physician's office, it is less expensive than other imaging methods, and it does not expose the patient to radiation. Prostate ultrasound (a rectal probe using ultrasonic waves to produce an image of the prostate gland) is being investigated for its ability to detect small, hidden tumors that would be missed by a digital rectal exam.

Treating Cancer

The ideal cancer therapy would kill or remove all cancerous cells while leaving normal tissue untouched. Sometimes this is almost possible, as when a surgeon removes a small superficial tumor of the skin. Usually the tumor is less accessible, and some combination of surgery, radiation therapy, and chemotherapy must be applied instead. Some patients choose to combine conventional therapies with alternative treatments (see the box "Avoiding Cancer Quackery").

retains some of the properties of the normal cell for a period of time. For instance, cancer of the thyroid gland may produce too much thyroid hormone and cause hyperthyroidism as well as cancer. Usually, however, cancer cells lose their resemblance to normal tissue as they continue to multiply, becoming groups of rogue cells with increasingly unpredictable behavior.

Cancers are classified according to the types of cells that give rise to them:

- **Carcinomas** arise from *epithelia*—tissues that cover external body surfaces, line internal tubes and cavities, and form the secreting portion of glands. This is the most common type of cancer. Major sites include the skin, breast, uterus, prostate, lungs, and gastrointestinal tract.
- **Sarcomas** arise from connective and fibrous tissues such as muscle, bone, cartilage, and the membranes covering muscles and fat.
- **Lymphomas** are cancers of the lymph nodes, part of the body's infection-fighting system.
- **Leukemias** are cancers of the blood-forming cells, which reside chiefly in the bone marrow.

Cancers vary greatly in how easily they can be detected and how well they respond to treatment. For example, certain types of skin cancer are easily detected, grow slowly, and are easy to remove; virtually all of these cancers are cured. Cancer of the pancreas, on the other hand, is difficult to detect or treat, and few patients survive the disease. In general, it is difficult for an **oncologist** or **hematologist** to predict how a specific cancer will behave because every one arises from a unique set of changes in a single cell.

The Incidence of Cancer

Each year more than 1.5 million people in the United States are diagnosed with cancer. Most will be cured, or live many years past their initial cancer diagnosis. In fact, the American

Cancer Society (ACS) estimates that the **five-year relative survival rate** for all cancers diagnosed between 2001 and 2007 is 67%. These statistics exclude more than 1 million cases of the curable types of skin cancer. Figure 16.5 shows the number of new cases of cancer each year, and the number of deaths, by cancer site.

At current U.S. rates, nearly one in two men and slightly more than one in three women will develop cancer at some point in their lives. Men and women share most of the major risk factors for cancer, but they often have a different experience because more than one-third of all cancers occur in sex organs (prostate, testes, breast, ovary, uterus, and cervix). For women, this means that in addition to lifestyle factors such as smoking, diet, and exercise, hormonal factors relating to their menstrual and childbearing history are also important risk considerations. Women may also have a greater biological vulnerability to certain carcinogens, such as those in cigarettes.

Overall, however, men are more likely than women to die of cancer. For some cancers, the differences are especially significant. Here are some of the factors underlying the higher death rates among men:

- **Higher rates of tobacco use:** In the past, men had significantly higher rates of smoking than women, leading to much higher rates of the many cancers linked to smoking. Men also use smokeless tobacco and cigars more often than women.
- **Higher rates of alcohol use and abuse:** Alcohol abuse is more common in men and is a risk factor for several cancers, including oral and liver cancers.
- **Greater occupational exposure to carcinogens:** Men are more likely to work in jobs where they are exposed to chemicals—including asbestos, arsenic, coal tar, pitch, and dyes—or radiation, and such exposure is a risk factor for cancers of the bladder, lung, and skin. Men are also more likely to have outdoor jobs involving frequent sun exposure.
- **Less use of preventive measures and less contact with health care providers:** Traditional gender roles may make men more likely to minimize symptoms and less likely to seek help or to discuss cancer-related worries with a health care provider. Men may neglect preventive care, such as using sunscreen, and screenings such as self-exams.

carcinoma Cancer that originates in epithelial tissue (skin, glands, and lining of internal organs).

sarcoma Cancer arising from bone, cartilage, or striated muscle.

lymphoma A tumor originating from lymphatic tissue.

leukemia Cancer of the blood or the blood-forming cells.

oncologist A specialist in the study of tumors.

hematologist A specialist in the study of blood disorders, including cancers such as leukemia and lymphoma.

five-year survival rate The percentage of patients diagnosed with a certain disease who will be alive five years after the date of diagnosis; used to estimate the prognosis of a particular disease.

TERMS

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Most people think of cancer as a death sentence, but is that necessarily true? Have you or has anyone you know had an experience with cancer? If so, what was the outcome? Have you ever considered whether you might be at increased risk for some types of cancer? Have you taken any steps to reduce your risk?

Until 1991 the number of cancer deaths increased fairly steadily in the United States, largely due to a wave of lethal lung cancers among men caused by smoking. In 1991 the cancer death rate in men began to fall. The cancer death rate in women began to fall in 2003; from 2004 to 2008 it decreased by 2.6% per year in men and 0.9% per year in women. This trend suggests that efforts at prevention, early detection, and improved therapy are all contributing to the improvement in mortality. However, death rates from cancer are not declining as fast as those from heart disease, in large part because of the differing effects that quitting smoking has on disease risk. Heart-related damage of smoking reverses more quickly and more significantly than the cancer-related damage from smoking. Smoking-related gene mutations cannot be reversed, although other mechanisms can sometimes control cellular changes. Heart disease also has other risk factors like high cholesterol and blood pressure, which can be diagnosed and controlled. If heart disease death rates continue to decline faster than cancer death rates, cancer may overtake heart disease as the leading cause of death among Americans of all ages.

Still, many more people could be saved from cancer. The overwhelming majority of skin cancers could be prevented by protecting the skin from excessive sun exposure, and the majority of lung cancer could be prevented by avoiding exposure to tobacco smoke. Thousands of cases of colon, breast, and uterine cancer could be prevented by improving the diet and controlling body weight. Regular screenings and self-examinations have the potential to save an additional 100,000 lives per year. Although cancer may seem like a mysterious disease, you can adopt many concrete strategies to reduce your risk.

QUICK STATS

Nearly 12 million Americans with a history of cancer were alive in January 2008.

—American Cancer Society, 2012

The smoker is not the only one at risk. Environmental tobacco smoke (ETS) is a human carcinogen—even brief exposure can cause serious harm. Long-term exposure to ETS increases the risk of lung cancer.

Detection and Treatment Lung cancer is difficult to detect at an early stage and hard to cure even when detected early. Symptoms of lung cancer do not usually appear until the disease has advanced to the invasive stage. Signs and symptoms such as a persistent cough, chest pain, or recurring bronchitis may be the first indication of a tumor's presence.

Studies suggest that spiral CT (computed tomography) scans, a computer-assisted body imaging technique, can detect lung cancer in high-risk patients significantly earlier than chest X-rays. When CT scanning is not available, a diagnosis can usually be made by chest X-ray or by studying the cells in sputum. Because almost all lung cancers arise from the cells that line the bronchi, tumors can sometimes be visualized by fiberoptic bronchoscopy, a test in which a flexible lighted tube is inserted into the windpipe and the surfaces of the lung passages are directly inspected.

Treatment for lung cancer depends on the type and stage of the cancer. If caught early, localized cancers can be treated with surgery alone. The majority of patients are diagnosed with advanced disease, however, and radiation and chemotherapy are often used in addition to surgery. Of patients with localized disease, 53% are alive five years after diagnosis. However, only about 15% of lung cancers are diagnosed at an early stage. The five-year survival rate for all stages combined is only 16%. Phototherapy, gene therapy, and immunotherapy (vaccines) are being studied in the hope of improving these statistics.

COMMON CANCERS

A discussion of all types of cancer is beyond the scope of this book. In this section we look at some of the most common cancers and their causes, prevention, and treatment.

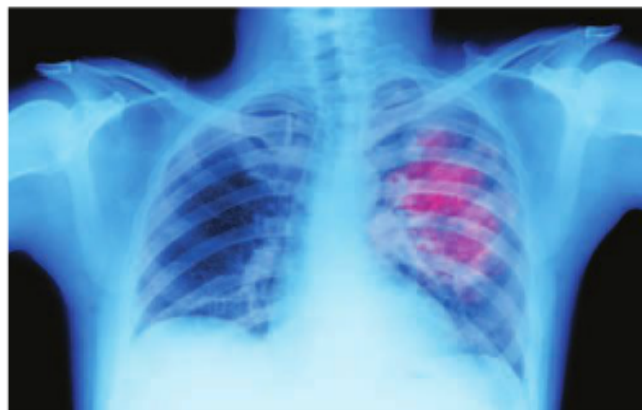
Lung Cancer

Lung cancer accounts for about 14% of all new cancer diagnoses and is the most common cause of cancer death in the United States: it is responsible for about 160,000 deaths each year. Since 1987 lung cancer has surpassed breast cancer as the leading cause of cancer death in women.

Risk Factors The chief risk factor for lung cancer is tobacco smoke, which currently accounts for 30% of all cancer deaths and 90% of lung cancer deaths. When smoking is combined with exposure to other carcinogens, such as asbestos particles or certain pollutants, the risk of cancer can be multiplied by a factor of 10 or more.

chemotherapy The treatment of cancer with chemicals that selectively destroy cancerous cells.

TERMS



Chest X-ray depicting a normal lung on the patient's right, and a lung cancer tumor on the patient's left.

Colon and Rectal Cancer

Another common cancer in the United States is colon and rectal cancer (also called *colorectal cancer*). Although there are effective screening methods for colorectal cancer, it is the third most common type of cancer.

Risk Factors Age is a key risk factor for colon and rectal cancer, with more than 91% of cases diagnosed in people aged 50 and older. Heredity also plays a role. Many cancers arise from preexisting **polyps**, which are small growths on the wall of the colon that may gradually develop into malignancies. The tendency to form colon polyps appears to be determined by specific genes, so many colon cancers may be due to inherited gene mutations. Chronic bowel inflammation and type 2 diabetes increase the risk of colon cancer.

Lifestyle is also a risk factor for colon and rectal cancer. Excessive alcohol use and smoking may increase the risk of colorectal cancer. Regular physical activity appears to reduce a person's risk, whereas obesity increases risk. A diet rich in red and processed meats increases risk, whereas eating fruits, vegetables, and whole grains is associated with lower risk. However, research findings on whether dietary fiber prevents colon cancer have been mixed. Studies have suggested a protective role for folic acid, magnesium, vitamin D, and calcium; in contrast, high intake of refined carbohydrates, simple sugars, and smoked meats and fish may increase risk.

Use of oral contraceptives or hormone replacement therapy may reduce risk in women. Regular use of nonsteroidal anti-inflammatory drugs such as aspirin and ibuprofen may decrease the risk of colon cancer and other cancers of the digestive tract. However, these agents are not recommended for colorectal cancer prevention, given that they can have other negative health effects.

Detection and Treatment If identified early, precancerous polyps and early-stage cancers can be removed before they become malignant or spread. Because polyps may bleed as they progress, common warning signs of colon cancer are bleeding from the rectum and a change in bowel habits.

Regular screening tests are recommended beginning at age 50 (earlier for people with a family history of the disease or who are otherwise at high risk). A yearly stool blood test can detect small amounts of blood in the stool long before obvious bleeding would be noticed. More involved screening tests are recommended at 5- or 10-year intervals, which

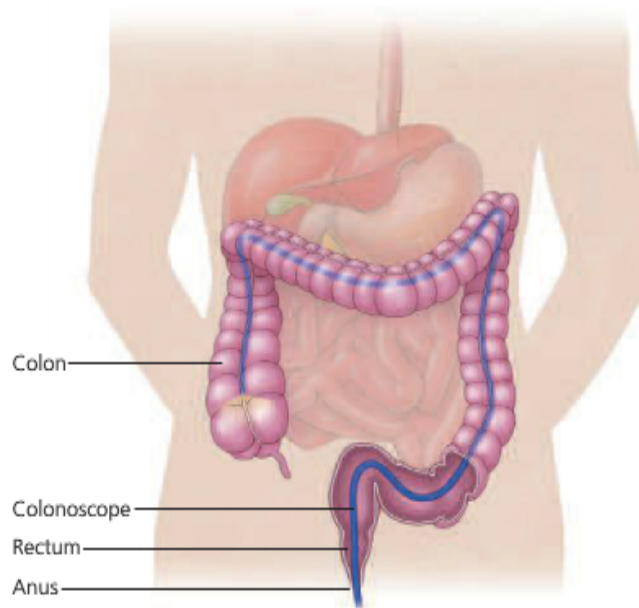


FIGURE 16.6 Colonoscopy.

include a sigmoidoscopy or colonoscopy (Figure 16.6), during which a flexible fiberoptic device is inserted through the rectum and the colon is examined and polyps biopsied or removed. Screening is effective, and studies demonstrate that it can prevent up to 76–90% of colon cancers. Still, only about half of U.S. adults have undergone any of these tests.

Surgery is the primary treatment for colon and rectal cancer. Radiation and chemotherapy may be used before surgery to shrink a tumor or after surgery to destroy any remaining cancerous cells. For advanced cancer, treatment with chemotherapy or monoclonal antibodies (discussed later in the chapter) is an option. This treatment inhibits the growth of new blood vessels (angiogenesis) in tumors. The five-year survival rate is 90% for colon and rectal cancers detected early and 64% overall.

Age, smoking, excessive alcohol use, and obesity are all associated with increased risk of colorectal cancer.

Breast Cancer

Breast cancer is the most common cancer in women. In men, breast cancer occurs only rarely. In the United States, about one woman in eight will develop breast cancer during her lifetime. About 227,000 American women are diagnosed with breast cancer each year. About 40,000 women die from breast cancer each year.

Fewer than 2% of breast cancer cases occur in women under age 35, but incidence rates increase quickly with age. About 50% of cases are diagnosed in women age 45–65. Rates decrease slightly for women in their 70s and 80s, although this could reflect a decrease in screening for this age population.

polyp A small, usually harmless, mass of tissue that projects from the inner surface of the colon or rectum.

TERMS

Risk Factors There is a strong genetic factor in breast cancer. A woman who has two close relatives with breast cancer is more than four times more likely to develop the disease than a woman who has no close relatives with it. However, even though genetic factors are important, inherited mutations in breast cancer susceptibility genes account for only approximately 5–10% of all breast cancer cases.

Other risk factors include early onset of menstruation, late onset of menopause, having no children or having a first child after age 30, current use of hormone replacement therapy, obesity, and alcohol use. Estrogen may be a unifying element for many of these risk factors. Estrogen circulates in a woman's body in high concentrations between puberty and menopause. Fat cells also produce estrogen, and estrogen levels are higher in obese women. Alcohol can interfere with estrogen metabolism in the liver and increase estrogen levels in the blood. Estrogen promotes the growth of cells in responsive sites, including the breast and the uterus, so any factor that increases estrogen exposure may raise breast cancer risk. A dramatic drop in rates of breast cancer from 2001 to 2004 was attributed in part to reduced use of hormone replacement therapy by women over 50 beginning in July 2002. Millions of women stopped taking the hormones after research from the Women's Health Initiative linked hormone replacement therapy with an increased risk of breast cancer and heart disease.

Although some of the risk factors for breast cancer cannot be changed, important lifestyle risk factors can be controlled. Eating a low-fat, vegetable-rich diet, exercising regularly, limiting alcohol intake, and maintaining a healthy body weight can minimize the chance of developing breast cancer, even for women at risk from family history or other factors. Despite some popular myths, studies have shown that breast cancer incidence is not increased by underwire bras, antiperspirants, breast implants, or abortions.

Early Detection A cure is most likely if breast cancer is detected early, so regular screening is a good investment, even for younger women. The ACS advises a three-part personal program for the early detection of breast cancer:

- **Mammography:** The ACS recommends a **mammogram** (low-dose breast X-ray) every year for women over 40. Mammography is especially valuable as an early detection tool because it can identify about 80–90% of breast cancers at an early stage, before physical symptoms develop. Some groups have argued that between ages 40 and 50 the rates of false positive mammograms are higher and thus women should not begin receiving mammograms until age 50. However, most organizations in the United States still recommend beginning screening with mammograms at age 40. Studies show that magnetic resonance imaging (MRI) may be better than mammography at detecting breast abnormalities in some women. The ACS recommends both an annual mammogram and an annual MRI for women who are at high

risk for breast cancer. A number of factors determine a woman's risk for developing breast cancer, and every woman should discuss her risk factors with a physician to determine what kinds of screening tests are warranted.

- **Ultrasonography** uses sound waves to create images of soft tissue. Although ultrasound is not often used as a standard screening tool for breast cancer, it is sometimes used as a follow-up investigational tool if a mammogram reveals an abnormality in breast tissue.

- **Clinical breast exam:** Women between ages 20 and 39 should have a clinical breast exam every three years, and women aged 40 and older should have one every year before their scheduled mammogram.

- **Breast self-exams:** Breast self-exam (BSE) allows a woman to become familiar with her breasts, so she can alert her health care provider to any changes. Women who choose to do breast self-exams should begin at age 20 (see the box "How to Perform a Breast Self-Exam").

Breast pain or tenderness is usually associated with benign conditions such as menstruation rather than breast cancer. The first physical signs of breast cancer are more likely to be a lump, swelling, or thickening; skin irritation or dimpling; or nipple pain, scaliness, or retraction. Although most breast lumps are benign, any breast lump should be brought to the attention of a health care provider.

Treatment If a lump is detected, it may be scanned by ultrasonography and biopsied to see if it is cancerous. In most cases, the lump is found to be a cyst or other harmless growth, and no further treatment is needed. If the lump contains cancer cells, a variety of surgeries may be indicated, ranging from a lumpectomy (removal of the lump and surrounding tissue) to a mastectomy (removal of the breast). For small/localized tumors, many studies have demonstrated that long-term survival for lumpectomy combined with radiation therapy is similar to that for mastectomy. To determine whether the cancer has spread, lymph nodes from the underarm may be removed and examined. If cancer cells are found, tumor cells remaining in the body can often be slowed or killed by additional therapy, such as hormone therapy, antibody therapy, radiation, chemotherapy, or a combination of these.

Survival of breast cancer varies, depending on the nature of the tumor and whether it has metastasized. If the tumor is discovered before it has spread to the adjacent lymph nodes

QUICK STATS

77% of cancers are diagnosed in people aged 55 and older.

—American Cancer Society, 2012

mammogram A low-dose X-ray of the breasts used to check for early signs of breast cancer.

ultrasonography An imaging method in which sound waves are bounced off body structures to create an image on a TV monitor; also called *ultrasound*.

TERMS



TAKE CHARGE

How to Perform a Breast Self-Exam

The best time for a woman to examine her breasts is when the breasts are not tender or swollen. Women who examine their breasts should have their technique reviewed during their periodic health exams by their health care professional.

Women with breast implants can do BSE.

It may be helpful to have the surgeon help identify the edges of the implant so that you know what you are feeling. There is some thought that the implants push out the breast tissue and may actually make it easier to examine. Women who are pregnant or breast-feeding can also choose to examine their breasts regularly.

It is acceptable for women to choose not to do BSE or to do BSE once in a while. Women who choose not to do BSE should still be aware of the normal look and feel of their breasts and report any changes to their doctor right away.

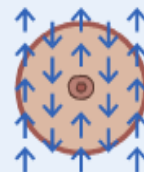
How to Examine Your Breasts

- Lie down and place your right arm behind your head. The exam is done while lying down, not standing up. This is because when lying down the breast tissue spreads evenly over the chest wall and is as thin as possible, making it much easier to feel all the breast tissue.
- Use the finger pads of the three middle fingers on your left hand to feel for lumps in the right breast. Use overlapping dime-sized circular motions of the finger pads to feel the breast tissue.
- Use three different levels of pressure to feel all the breast tissue. Light pressure is needed to feel the tissue closest to the skin;

medium pressure to feel a little deeper; and firm pressure to feel the tissue closest to the chest and ribs. It is normal to feel a firm ridge in the lower curve of each breast but you should tell your doctor if you feel anything else out of the ordinary. If you're not sure how hard to press, talk with your doctor or nurse. Use each pressure level to feel the breast tissue before moving on to the next spot.

- Move around the breast in an up and down pattern starting at an imaginary line drawn straight down your side from the underarm and moving across the breast to the middle of the chest bone (sternum or breastbone). Be sure to check the entire breast area going down until you feel only ribs and up to the neck or collar bone (clavicle).

- There is some evidence to suggest that the up-and-down pattern (sometimes called the vertical pattern) is the most effective pattern for covering the entire breast, without missing any breast tissue.



- Repeat the exam on your left breast, putting your left arm behind your head and using the finger pads of your right hand to do the exam.
- While standing in front of a mirror with your hands pressing firmly down on your hips, look at your breasts for any changes of size, shape, contour, or dimpling, or redness or scaliness of the nipple or breast skin. (The pressing down on the hips position contracts the chest wall muscles and enhances any breast changes.)
- Examine each underarm while sitting up or standing and with your arm only slightly raised so you can easily feel in this area. Raising your arm straight up tightens the tissue in this area and makes it harder to examine.

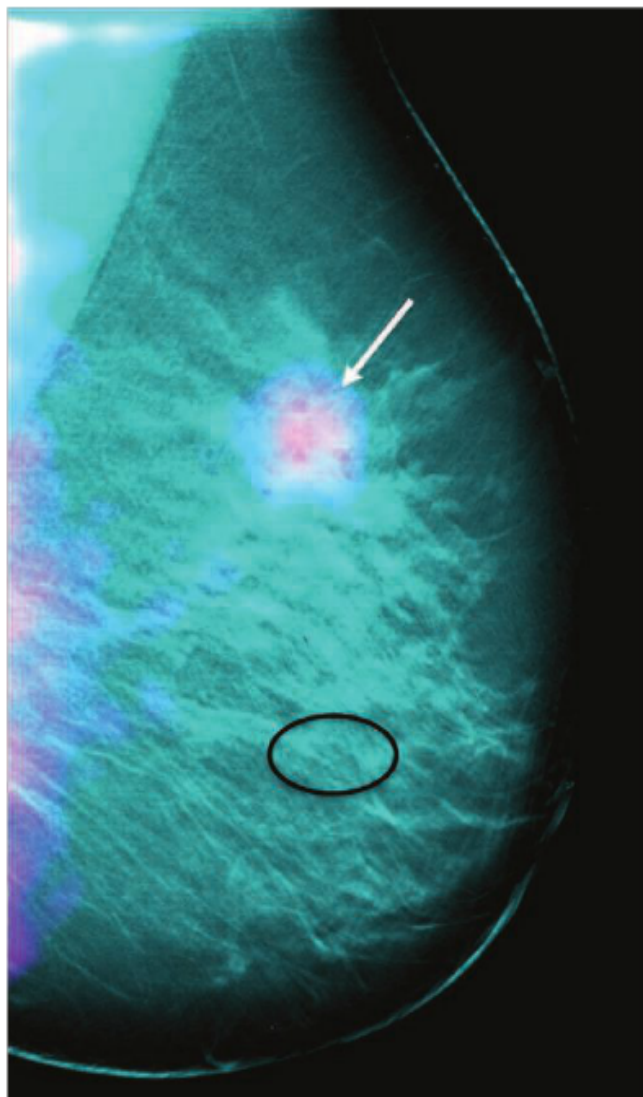
This procedure for doing breast self-exam is different from previous recommendations. These changes represent an extensive review of the medical literature and input from an expert advisory group. There is evidence that this position (lying down), the area felt, pattern of coverage of the breast, and use of different amounts of pressure increase a woman's ability to find abnormal areas.

SOURCE: From the American Cancer Society's website. Reprinted by the permission of the American Cancer Society Inc. from www.cancer.org. All rights reserved.

or outside the breast, the patient has about a 99% chance of surviving more than five years. The relative survival rate for all stages is 90% at five years.

New Strategies for Treatment and Prevention A number of drugs have been developed for the treatment or prevention of breast cancer. A family of drugs called *selective estrogen receptor modulators (SERMs)* act like estrogen in some tissues of the body but block estrogen's effects in others. One SERM, tamoxifen, has long been used in breast cancer treatment because it blocks the action of estrogen in breast

tissue. In 1998 the FDA approved the use of tamoxifen to reduce the risk of breast cancer in healthy women who are at high risk for the disease. However, the drug has serious potential side effects, including increased risk of blood clots and uterine cancer. Another SERM, raloxifene, was approved in 2007 for the reduction of invasive breast cancer risk in postmenopausal women at high risk for breast cancer. Compared to tamoxifen, raloxifene has been shown to pose a slightly lower risk of blood clots and uterine cancer, but the risk is still higher than that of a placebo. Raloxifene has also been shown to improve bone mineral density.



Mammogram image depicting a breast cancer tumor.

Women may take tamoxifen or other anti-hormonal agents and/or undergo chemotherapy to help reduce the risk of recurrence. Analyzing the tumor specimen with special stains can help predict the risk of breast cancer recurrence and help identify women who will benefit most from chemotherapy; women can then make more informed treatment decisions. Treatment with the **monoclonal antibodies** trastuzumab or lapatinib is an option for some women. Antibodies, discussed in Chapter 17, are proteins produced by the immune system that recognize and bind to foreign substances such as bacteria. A monoclonal antibody is a special type of antibody that is produced in a laboratory and designed to bind to a specific cancer-related target. Many other monoclonal antibodies are currently in development for breast cancer.

Prostate Cancer

The prostate gland is located at the base of the bladder in men and completely surrounds the male's urethra; if enlarged, it

can block the flow of urine. Prostate cancer is the most common cancer in men and the second leading cause of cancer death in men. Nearly 242,000 new cases are diagnosed each year, and more than 28,000 American men die from the disease each year.

Risk Factors Age is the strongest predictor of risk, with approximately 60% of cases of prostate cancer diagnosed in men over age 65. Inherited genetic predisposition may be responsible for 5–10% of cases, and men with a family history of the disease should be particularly vigilant about screening. African American men and Jamaican men of African descent have the highest rates of prostate cancer of any groups in the world. Both genetic and lifestyle factors may be involved.

Diets high in calories, dairy products, and animal fats and low in plant foods have also been implicated as possible culprits, as have obesity, inactivity, and a history of sexually transmitted diseases. Type 2 diabetes and insulin resistance are also associated with prostate cancer. Soy foods, tomatoes, and cruciferous vegetables are being investigated for their possible protective effects.

Detection Early prostate cancer usually has no symptoms. Warning signs of prostate cancer can include changes in urinary frequency, weak or interrupted urine flow, painful urination, and blood in the urine.

Techniques for early detection include a digital rectal examination and the **prostate-specific antigen (PSA) test**. Currently there is insufficient data in support of or against routine screening with the PSA test. The ACS recommends that men be provided information about the benefits and limitations of the tests and that both the exam and the PSA test be offered annually, beginning at age 50, for men who are at average risk of prostate cancer, do not have any major medical problems, and have a life expectancy of at least 10 years. Men at high risk, including African Americans and those with a family history of the disease, should consider beginning screening at age 45. Men with multiple family members who have been diagnosed with the disease should begin screening at age 40.

During a digital rectal exam, a physician feels the prostate gland through the rectum to determine if the gland is enlarged or if lumps are present. The PSA test may detect an elevated level or a rapid increase in PSA. An elevated PSA test can be reflective of early prostate cancer, but it also can be associated with benign conditions (more than half of men over 50 have benign prostate disease) and very slow-growing cancers that are unlikely to kill affected individuals.

monoclonal antibody An antibody designed to bind to a specific cancer-related target.

TERMS

prostate-specific antigen (PSA) test A screening test for prostate cancer that measures blood levels of prostate-specific antigen (PSA).



African American men have the highest rate of prostate cancer of any group in the world. The American Cancer Society recommends that they consider prostate cancer screening starting at age 45.

PSA testing has been a subject of controversy among experts for several years because of its tendency to yield misleading results, leading to further testing, including biopsies, that can potentially cause harm. This is especially a concern for older men (over 75), who are more likely to die of other causes even if they have slow-growing prostate cancer. In older men, most prostate cancers are not deadly, making treatments pointless and potentially harmful.

Treatment Treatments vary based on the stage of the cancer and the age of the patient. A small, slow-growing tumor in an older man may be treated with watchful waiting and no initial therapy because he is more likely to die from another cause before his cancer becomes life-threatening. More aggressive treatment would be indicated for younger men or those with more advanced cancers. Treatment may involve *radical prostatectomy* (surgical removal of the prostate). Although radical surgery has an excellent cure rate, it is major surgery and often results in **incontinence** and/or **erectile dysfunction**. Minimally invasive surgery, which utilizes a laparoscopic or robotic approach, can sometimes be performed with fewer complications and quicker recovery.

PSA testing is controversial; men should ask their doctors about the need for prostate cancer screening.

A less invasive alternative involves surgical implantation of radioactive seeds. Radiation from the seeds destroys the tumor and much of the normal prostate tissue but leaves surrounding tissue relatively untouched. Alternative or additional treatments include external radiation, hormonal therapy, cryotherapy, and chemotherapy. Several new treatments for advanced prostate cancer have recently been approved by the U.S. Food and Drug Administration (FDA). A cancer vaccine, known as sipuleucel-T, was approved for some men with hormone-refractory advanced prostate cancer. Another option is Abiraterone, which was approved for the treatment of metastatic prostate cancer that is resistant to hormonal therapy and chemotherapy.

Survival rates for all stages of this cancer have improved steadily since 1940; the five-year survival rate is now nearly 100%.

Cancers of the Female Reproductive Tract

Several types of cancer can affect the female reproductive tract, and a few of these cancers are relatively common.

Cervical Cancer Cancer of the cervix occurs in women in their twenties and thirties. In the United States more than 12,000 women are diagnosed with cervical cancer each year, and the disease kills approximately 4,200 women annually.

Cervical cancer is largely a sexually transmitted disease. Virtually all cases of cervical cancer stem from infection by the human papillomavirus (HPV), a group of about 100 related

viruses that also cause common warts and genital warts. When certain types of HPV are introduced into the cervix, usually by an infected sex partner, the virus infects cervical cells, causing them to divide and grow. If unchecked, this growth can develop into cervical cancer. Cervical cancer is associated with multiple sex partners and is extremely rare in women who have not had heterosexual intercourse. Smoking, immunosuppression, and prolonged use of oral contraceptives also have been associated with increased risk.

Screening for the changes in cervical cells that precede cancer is done chiefly by means of the **Pap test**. During a pelvic exam, loose cells are scraped from the cervix and examined under a microscope to see whether they are normal. If cells are abnormal but not yet cancerous, the patient has a condition commonly referred to as *cervical dysplasia*. Sometimes such abnormal cells spontaneously return to normal, but in

Incontinence The inability to control the flow of urine.

Pap test A scraping of cells from the cervix for examination under a microscope to detect cancer.

TERMS

about one-third of cases the cellular changes progress toward malignancy. If this happens, the abnormal cells must be removed, either surgically or with a cryoscopic (ultracold) probe or localized laser treatment. When abnormal cells are in a precancerous state, the small patch of dangerous cells can be completely removed.

Without timely surgery, the malignant cells invade the cervical wall and spread to the uterus and adjacent lymph nodes. At this stage, chemotherapy may be used with radiation to kill the cancer cells, but chances for a complete cure are reduced. Even when a cure can be achieved, it often requires surgical removal of the uterus.

Because the Pap test is highly effective, all sexually active women and women between ages 18 and 70 should be tested. The recommended schedule for testing depends on risk factors, the type of Pap test performed, and whether the Pap test is combined with HPV testing.

Two HPV vaccines have been approved by the FDA for the prevention of cervical cancer. Women who receive one of the vaccines should continue to receive routine Pap tests because the vaccines do not protect against all types of the virus (see the box “HPV and Cancer”).

Uterine, or Endometrial, Cancer Cancer of the lining of the uterus (the *endometrium*) most often occurs after the age of 55. Uterine cancer strikes more than 47,000 American women annually and kills over 8,000 women each year.

The risk factors are similar to those for breast cancer, including prolonged exposure to estrogen, early onset of menstruation, late menopause, never having been pregnant, and obesity. Type 2 diabetes is also associated with increased risk. The use of oral contraceptives and hormone therapy that contain estrogen plus progestin do not appear to increase risk.

Endometrial cancer often presents with abnormal vaginal bleeding in a postmenopausal woman. It is treated surgically, commonly by *hysterectomy*, or removal of the uterus. Radiation treatment, hormones, and chemotherapy may be used in addition to surgery. When the tumor is detected at an early stage, about 96% of patients are alive and disease-free five years later. When the disease has spread beyond the uterus, the five-year survival rate is less than 67%.

Ovarian Cancer Although ovarian cancer is rare compared with cervical or uterine cancer, it causes more deaths than the other two combined. There are often no warning signs of ovarian cancer. Early symptoms may include increased abdominal size and bloating, urinary urgency, and pelvic pain. It cannot be detected by Pap tests or any other simple screening method and is often diagnosed late in its development, when surgery and other therapies are unlikely to be successful.

The risk factors are similar to those for breast and endometrial cancer: increasing age (most ovarian cancer occurs after

age 60), never having been pregnant, a family history of breast or ovarian cancer, obesity, and specific genetic mutations. A high number of ovulations appears to increase the chance that a cancer-causing genetic mutation will occur, so anything that lowers the number of lifetime ovulation cycles—pregnancy, breastfeeding, or use of oral contraceptives—reduces a woman’s risk of ovarian cancer.

There is currently no accurate screening test to detect ovarian cancer. Women with symptoms or who are at high risk because of family history or because they harbor a mutant gene may be offered screening with a pelvic exam, ultrasound, and blood test for the tumor marker CA125. The use of these tests remains controversial because no data have demonstrated an improvement in mortality when these tests are used for screening.

Ovarian cancer is treated by surgical removal of both ovaries, the fallopian tubes, and the uterus. Radiation and chemotherapy are sometimes used in addition to surgery. When the tumor is localized to the ovary, the five-year survival rate is 93%. For all stages, the five-year survival rate is only 44%, reflecting the difficulty of early detection.

QUICK STATS

55 million Pap tests are performed each year in the United States; about 6% are abnormal and require medical follow-up.

—National Cancer Institute, 2009

Skin Cancer

Skin cancer is the most common type of cancer, but it is often not included in cancer incidence and mortality statistics because many types of skin cancer are easily curable. Of the approximate 3.5 million cases of skin cancer diagnosed each year, about 76,000 are of the most serious type, **melanoma**.

Risk Factors Almost all cases of skin cancer can be traced to excessive exposure to **ultraviolet (UV) radiation** from the sun, including longer-wavelength ultraviolet A (UVA) and shorter-wavelength ultraviolet B (UVB) radiation. UVB radiation causes sun-

burns and can damage the eyes and the immune system. UVA is less likely to cause an immediate sunburn, but it damages connective tissue and leads to premature aging of the skin, giving it a wrinkled, leathery appearance. (Tanning lamps and tanning salon beds emit mostly UVA radiation.) Both UVA and UVB radiation have been linked to the development of skin cancer, and the National Toxicology Program has declared both solar and artificial sources of UV radiation, including sunlamps and tanning beds, to be known human carcinogens.

Both severe, acute sun reactions (sunburns) and chronic low-level sun reactions (suntans) can lead to skin cancer. People with fair skin have less natural protection against skin

melanoma A malignant tumor of the skin that arises from pigmented cells, usually a mole.

ultraviolet (UV) radiation Light rays of a specific wavelength emitted by the sun; most UV rays are blocked by the ozone layer in the upper atmosphere.

TERMS



WELLNESS ON CAMPUS

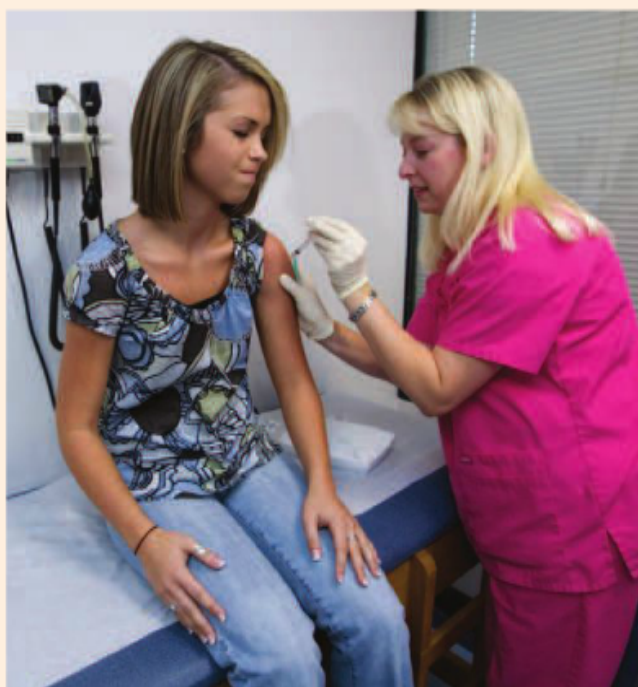
HPV and Cancer

Human papillomavirus (HPV), the virus that causes the most commonly diagnosed sexually transmitted disease in the United States, is linked to several types of cancer. About 75–80% of sexually active adults will acquire HPV before the age of 50. Much of the time, the infection clears and the person may never know that he or she was infected. People with persistent HPV infection are at the highest risk of developing pre-cancerous or cancerous lesions, a process that can take months or years. The regular use of condoms can reduce the risk of transmitting HPV.

HPV may be best known for causing genital warts, which usually appear as pink or gray bumps on the skin of the penis, vulva, cervix, vagina, or anal region. Two types of HPV (genotypes 6 and 11) cause approximately 90% of all cases of genital warts. For some people, infections are asymptomatic, but others require treatment with chemical agents, immunotherapy, or surgery. Several types of cancer are linked to HPV infection. These include the following:

- **Cervical cancer:** HPV is thought to be responsible for more than 99% of all cervical cancers. Each year in the United States, approximately 12,000 women develop cervical cancer, and over 4,200 die from it. In developing countries, cervical cancer is the second most common cause of cancer-related deaths. On average, it takes 15 years from the time of initial HPV infection for invasive cervical cancer to develop.
- **Oropharyngeal cancer:** Nearly 50% of all cancers of the oropharynx (mouth and throat), particularly the tonsils and base of tongue, are related to HPV infection. Patients require aggressive therapy with combined chemotherapy and radiation, which have severe side effects of their own.
- **Other cancers:** Up to 70% of cancers of the vulva, vagina, and penis and approximately 90% of anal cancers have been linked to HPV infection. Even when they can be treated locally, such cancers can cause significant compromise of sexual function and lead to long-term illness.

Currently two commercially available HPV vaccines are approved by the FDA. Gardasil targets four types of HPV (genotypes 6, 11, 16, 18). Cervarix targets genotypes 16 and 18 only. Both vaccines are administered in three doses. In 2007 the Advisory



Committee on Immunization Practices recommended that all girls be vaccinated at age 11–12 with Gardasil and that females aged 13–26 who had not been previously vaccinated receive catch-up vaccinations. In 2009 the committee added Cervarix to the list of approved vaccines for the prevention of cervical cancer, and an FDA panel expanded the recommendation for Gardasil vaccination to males age 9–26 for the prevention of genital warts and anal cancer.

Young girls are targeted for vaccination because the greatest benefits are experienced by those who are not yet sexually active. However, it is likely that young sexually active individuals will not have been exposed to all HPV genotypes targeted by the vaccines. Thus individuals who have already been infected

with one or more HPV types will still derive protection from the vaccine types they have not acquired. Women who are vaccinated still need to receive regular Pap tests for cervical cancer screening because not all of the HPV genotypes responsible for cervical cancer are covered by the vaccine.

Data from the National Immunization Survey of Teens demonstrated that among girls aged 13 to 17, initiation of the HPV vaccine (at least one of the three-dose HPV vaccination series) increased from 25.1% in 2007 to 44.3% in 2009. Nearly one-third (26.7%) of girls had the complete three-shot vaccine series in 2009. As more educational programs are launched, experts hope that vaccination rates will increase, leading to associated declines in the rates of HPV-related cancers. Chapter 18 discusses HPV and other sexually transmitted diseases in detail.

SOURCES: Slade, B. A., et al. 2009. Postlicensure safety surveillance for quadrivalent human papillomavirus recombinant vaccine. *Journal of the American Medical Association* 302(7): 750–757; Ryerson, A. B., et al. 2008. Burden of potentially human papillomavirus-associated cancers of the oropharynx and oral cavity in the U.S., 1998–2003. *Cancer* 113(10 Suppl.): 2901–2909; Broomall, E. M., et al. 2010. Epidemiology, clinical manifestations, and recent advances in vaccination against human papillomavirus. *Postgraduate Medicine* 122(2): 121–129; Wong, C., et al. 2010. *National HPV Vaccine Uptake and Vaccination Predictors and Barriers for Girls 8–17 Years Old*. Oral Presentation at the National STD Prevention Conference, March 8–11, 2010, Atlanta; Centers for Disease Control and Prevention. 2011. National and state vaccination coverage among adolescents aged 13 through 17 years—United States, 2010. *Morbidity and Mortality Weekly Reports*, August 26, 60(33): 1117–1123.

ASSESS YOURSELF

What's Your UV Risk?



Your risk of skin cancer from the ultraviolet radiation in sunlight depends on several factors. Take this quiz to see how sensitive you are. The higher your UV risk score, the greater your risk of skin cancer—and the greater your need to take precautions against too much sun.

Score 1 point for each true statement:

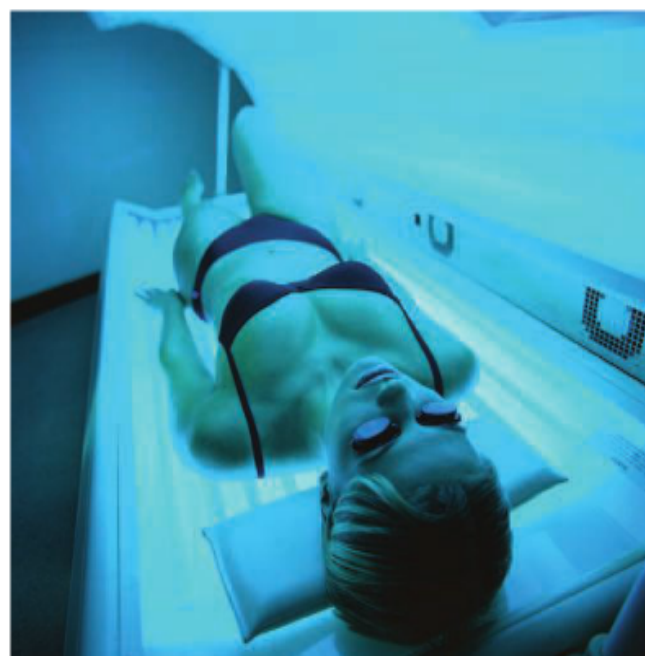
- _____ 1. I have blond or red hair.
- _____ 2. I have light-colored eyes (blue, gray, green).
- _____ 3. I freckle easily.
- _____ 4. I have many moles.
- _____ 5. I had two or more blistering sunburns as a child.
- _____ 6. I spent lots of time in a tropical climate as a child.
- _____ 7. I have a family history of skin cancer.
- _____ 8. I work outdoors.
- _____ 9. I spend a lot of time in outdoor activities.
- _____ 10. I like to spend as much time in the sun as I can.
- _____ 11. I sometimes go to a tanning parlor or use a sunlamp.
- _____ Total score

Score	Risk of Skin Cancer from UV Radiation
0	Low
1–3	Moderate
4–7	High
8–11	Very high

For self-assessments for other types of cancer, visit the Harvard Center for Cancer Prevention's Disease Risk Index website (<http://www.diseaseriskindex.harvard.edu/update>).

SOURCE: Copyright 1996 "Skin Cancer Risk Assessment" adapted from Neil Shear 1996 and published in "What's Your UV-Risk Score." Published by Consumers Union of U.S., Inc., Yonkers, NY 10703–1057, a nonprofit organization. Reprinted with permission from the June 1996 issue of *Consumer Reports on Health*® for educational purposes only. No commercial use or reproduction permitted. www.ConsumerReportsHealth.org

damage from the sun and a higher risk of developing skin cancer, whereas people with naturally dark skin have a considerable degree of protection (see the box "What's Your UV Risk?"). Caucasians are about 10 times more likely than African Americans to develop melanoma, but African Americans and Latinos are still at risk. Before age 40, incidence rates are



Tanning, either under direct sunlight or in a tanning bed, is a known cause of skin cancer.

higher in women than in men. After 40, rates are nearly twice as high in men as in women.

Severe sunburns in childhood have been linked to a significantly increased risk of skin cancer in later life, so children in particular should be protected. According to the Skin Cancer Foundation, the risk of skin cancer doubles in people who have had five or more sunburns in their lifetime. Because of damage to the ozone layer of the atmosphere (discussed in Chapter 19), there is a chance that we may all be exposed to increasing amounts of UV radiation in the future.

Other risk factors for skin cancer include having many moles (particularly large ones), spending time at high altitudes, and a family history of the disease. Skin cancer may also be caused by exposure to coal tar, pitch, creosote, arsenic, and radioactive materials. Compared to sunlight, however, these agents account for only a small proportion of skin cancers.

Types of Skin Cancer There are three main types of skin cancer, named for the types of skin cells from which they develop. **Basal cell** and **squamous cell carcinomas** together account for about 95% of the skin cancers diagnosed each year. They are usually found in chronically sun-exposed areas, such as the face, neck, hands, and arms. They usually appear as pale, waxlike, pearly nodules or red, scaly, sharply outlined

basal cell carcinoma Cancer of the deepest layers of the skin.

squamous cell carcinoma Cancer of the surface layers of the skin.

TERMS



CRITICAL CONSUMER

Sunscreens and Sun-Protective Clothing

If you consistently use sun-protective clothing, sunscreen, and common sense, you can lead an active outdoor life *and* protect your skin against most sun-induced damage.

Clothing

- Wear long-sleeved shirts and long pants. Consider clothing made from special sun-protective fabrics; these garments have an ultraviolet protection factor (UPF) rating, similar to the SPF for sunscreens.
- Wear a hat. A good choice is a broad-brimmed hat or a legionnaire-style cap that covers the ears and neck. Wear sunscreen on your face even if you are wearing a hat.
- Wear sunglasses. Exposure to UV rays can damage the eyes and cause cataracts.

Sunscreen

- Use a sunscreen and lip balm with a sun protection factor (SPF) of 15 or higher. An SPF rating refers to the amount of time you can stay out in the sun before you burn, compared with not using sunscreen. For example, a product with an SPF of 15 would allow you to remain in the sun without burning 15 times longer, on average, than if you didn't apply sunscreen.

- Shake sunscreen before applying. Apply it 30 minutes before exposure to allow it time to bond to the skin. Reapply sunscreen frequently and generously to all sun-exposed areas. Reapply sunscreen 15–30 minutes after sun exposure begins and then every two hours after that and/or following activities, such as swimming, that could remove sunscreen.

Time of Day and Location

- Avoid sun exposure between 10 a.m. and 4 p.m., when the sun's rays are most intense.
- Consult the day's UV index, which predicts UV levels on a 0–11+ scale, to get a sense of the amount of sun protection you'll need. UV index ratings are available in local newspapers, from the weather bureau, or from certain websites.

Tanning Salons

- Avoid tanning salons. Tanning beds and lamps emit mostly UVA radiation, increasing your risk of premature skin aging (such as wrinkles) and skin cancer.
- If you really want a tan, consider using a sunless tanning product. Lotions, creams, and sprays containing the color additive dihydroxyacetone (DHA) are approved by the FDA for tanning.

patches. These cancers are often painless, although they may bleed, crust, and form an open sore on the skin.

Melanoma is by far the most dangerous skin cancer because it spreads so rapidly. It can occur anywhere on the body, but the most common sites are the back, chest, abdomen, and lower legs. A melanoma usually appears at the site of a preexisting mole. The mole may begin to enlarge, become mottled or varied in color (colors can include blue, pink, and white), or develop an irregular surface or irregular borders. Tissue invaded by melanoma may also itch, burn, or bleed easily.

Prevention One of the major steps you can take to protect yourself against all forms of skin cancer is to avoid lifelong overexposure to sunlight. Blistering, peeling sunburns from unprotected sun exposure are particularly dangerous, but suntans—whether from sunlight or from tanning lamps—also increase your risk of developing skin cancer later in life. People of every age, especially babies and children, need to be protected from the sun with **sunscreens** and protective clothing. For a closer look at sunlight and skin cancer, see the box “Sunscreens and Sun-Protective Clothing.”

Most cases of skin cancer are so easily detected and treated that they aren't even included in cancer surveillances.

Detection and Treatment The only sure way to avoid a serious outcome from skin cancer is to make sure it is recognized and diagnosed early. The majority of melanomas are brought to a physician's attention by patients themselves. Make it a habit to examine your skin regularly. Most of the spots, freckles, moles, and blemishes on your body are normal; you were born with some of them, and others appear and disappear throughout your life. But if you notice an unusual growth, discoloration, sore that does not heal, or mole that undergoes a sudden or progressive change, see your physician or dermatologist immediately.

Figure 16.7 illustrates the characteristics that may signal a melanoma—**asymmetry**, **border irregularity**, **color change**, and a **diameter greater than 1/4 inch**. A mole that changes in size, shape, or color is also of concern. If someone in your family has had multiple skin cancers or melanomas, consult a dermatologist for a complete skin examination and discussion of your particular risk.

sunscreen A substance used to protect the skin from UV rays; usually applied as a lotion, cream, or spray.

TERMS

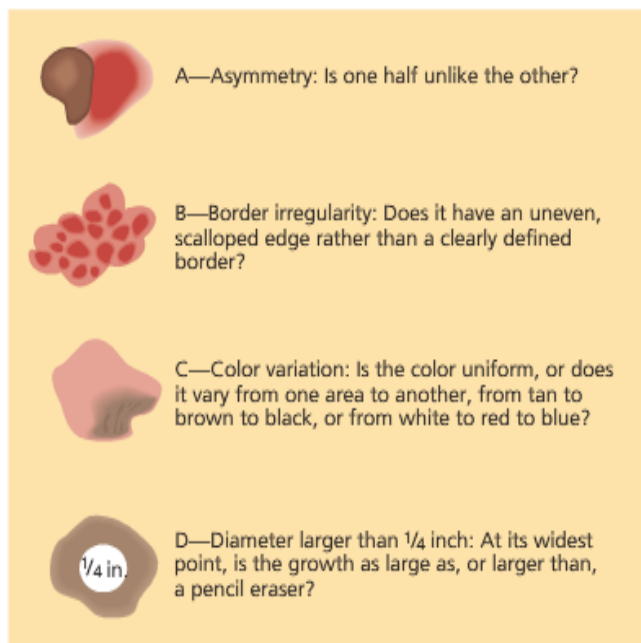


FIGURE 16.7 The ABCD test for melanoma. To see a variety of photos of melanoma and benign moles, visit the National Cancer Institute's Visuals Online site (<http://visualsonline.cancer.gov>).

If you have an unusual skin lesion, your physician will examine it and possibly perform a biopsy. If the lesion is cancerous, it is usually removed surgically, a procedure that can almost always be performed in the physician's office using a local anesthetic. Occasionally other forms of treatment may be used. In 2011 the FDA approved two new therapies for metastatic melanoma. Ipilimumab (Yervoy), a monoclonal antibody that activates the body's anticancer immune response, was approved for patients with previously untreated metastatic melanoma. In combination with standard chemotherapy, ipilimumab extended survival by two months and is the first drug to improve survival for metastatic melanoma. Vemurafenib (Zelboraf), which targets a specific gene mutation in melanoma, also improved survival in patients with advanced melanoma compared with standard chemotherapy. For melanoma, the five-year survival rate is 98% if the tumor is localized but only 62% if the cancer has spread to adjacent lymph nodes. Improvements in survival are anticipated with the use of these new targeted treatments.

Head and Neck Cancers

Head and neck cancers—cancers of the oral cavity, pharynx, larynx, and nasal cavity—can be traced principally to cigarette, cigar, or pipe smoking, the use of spit tobacco, and the excessive consumption of alcohol. These risk factors work together to multiply a person's risk of oral cancer. The incidence of head and neck cancer is twice as great in men as in women, and the disease is most frequent in men over 40. Some prominent sufferers of oral cancer have included Sigmund Freud and Fidel Castro, both notorious cigar smokers. Sports figures who have cultivated a taste for spit tobacco are now also increasingly

being diagnosed with oral cancer. Among long-term snuff users, the excess risk of cancers of the cheek, tongue, and gum is nearly 50-fold (see Chapter 11 for more about cigars and spit tobacco). Additionally, cancers of the tonsils and tongue base are commonly related to HPV infection.

Chemotherapy, radiation, and surgery are the primary methods of treatment for head and neck cancers. Patients often endure intense mouth and throat inflammation and some require disfiguring surgeries, but many can be cured. Among those who survive, a significant number will develop another primary cancer of the head and neck. The five-year survival rate is about 61%.

Testicular Cancer

Testicular cancer is relatively rare, accounting for only 1% of cancer in men (about 8,590 cases per year), but it is the most common cancer in men aged 20–35. It is much more common among white Americans than among Latinos, Asian Americans, or African Americans. It is also relatively common among men whose fathers had testicular cancer. Men with undescended testicles are at increased risk for testicular cancer, and for this reason that condition should be corrected in early childhood.

Self-examination may help in the early detection of testicular cancer (see the box “Testicle Self-Examination”). Tumors are treated by surgical removal of the testicle and, if the tumor has spread, by chemotherapy; radiation treatment is used only rarely. The five-year survival rate for testicular cancer is 95%.

Other Cancers

Several other cancers affect a significant number of people each year. Some have identifiable risk factors, particularly smoking and obesity, that are controllable. Causes of others are still under investigation.

Pancreatic Cancer The pancreas, a gland found deep within the abdomen behind the stomach, produces both digestive enzymes and insulin. Because of the gland's hidden location, pancreatic cancer is usually well advanced before symptoms become noticeable. About 43,920 new cases occur annually, and nearly 37,400 deaths.

Incidence rates are approximately twice as high for cigarette smokers as for nonsmokers. Other risk factors include being male, African American, obese, sedentary, or over age 60; having a family history of pancreatic cancer; having diabetes; and eating a diet high in fat and meat and low in vegetables. Fewer than 20% of patients are candidates for potentially curative surgeries because pancreatic cancer is usually detected only after it has spread outside the pancreas or is locally advanced. Even for those who have potentially curative surgeries to remove their tumors, the cancer often returns. Chemotherapy and radiation provide only modest benefits.

Stomach Cancer Stomach cancer is the most common form of cancer in many parts of the world, but it is relatively rare in the United States, with about 21,300 new cases and



TAKE CHARGE

Testicle Self-Examination

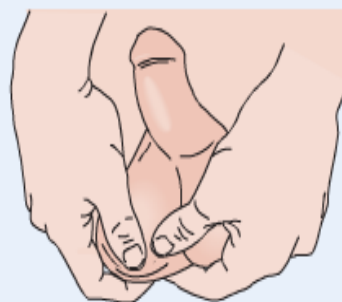
The best time to perform a testicular self-exam is after a warm shower or bath, when the scrotum is relaxed.

First, stand in front of a mirror and look for any swelling of the scrotum. Then examine each testicle with both hands. Place the index and middle fingers under the testicle and the thumbs on top. Roll the testicle gently between the fingers and thumbs. Don't worry if one testicle seems slightly larger than the other; that's common. Also, expect to feel the epididymis, which is the soft, sperm-carrying tube at the rear of the testicle.

Perform a self-exam each month. If you find a lump, swelling, or nodule, see a physician right away. The abnormality may not

be cancer, but only a physician can make a diagnosis.

Other possible signs of testicular cancer include a change in the way a testicle feels, a sudden collection of fluid in the scrotum, a dull ache in the lower abdomen or groin, a feeling of heaviness in the scrotum, or pain in a testicle or the scrotum.



SOURCES: Testicular Cancer Resource Center. 2009. *How to Do a Testicular Self Examination* (<http://tcrc.acor.org/tcexam.html>); National Cancer Institute. 2005. *Questions and Answers about Testicular Cancer* (<http://www.cancer.gov/cancertopics/factsheet/sites-types/testicular>).

10,500 deaths each year. Approximately two-thirds of people with stomach cancer are 65 or older, and it is slightly more common in men than women.

Risk factors include infection with the bacterium *Helicobacter pylori*, which has also been linked to the development of ulcers, and a diet high in smoked, salted, or pickled fish or meat. Bacteria, including *H. pylori*, can convert the nitrites in preserved foods into carcinogenic amines, and salt can break down the normal protective stomach coating, allowing these carcinogenic compounds access to the cells of the stomach wall. However, the great majority of people with *H. pylori* infection do not develop stomach cancer, particularly if they eat a low-salt diet with plenty of fruits, vegetables, and whole grains.

There is no screening test for stomach cancer. It is usually recognized only after it has spread, and the five-year survival rate is only 28% for all stages.

Bladder Cancer This cancer is about three times as common in men as in women, and smoking is the key risk factor. (Smokers are twice as likely to develop bladder cancer as nonsmokers.) People living in urban areas and workers exposed to chemicals used in the dye, rubber, and leather industries are also at increased risk.

There is no screening test for bladder cancer. The first symptoms are likely to be blood in the urine and/or increased frequency of urination. These symptoms can also signal a urinary infection but should trigger a visit to a physician, who can evaluate the possibility of cancer. With early detection, more than 90% of cases are curable. There are about 73,500 new cases and 14,900 deaths each year.

Kidney Cancer Although this cancer usually occurs in people over 50, anyone can develop it, and there are few controllable risk factors. Smoking and obesity are mild risk factors, as is a family history of the disease. Symptoms may include fatigue, pain in the side, and blood in the urine. Kidney

cancer is difficult to treat, with a five-year survival rate of only 70% for all stages. Recently immune cell therapies and targeted agents such as angiogenesis inhibitors have shown some promise in the disease's advanced stage. There are about 64,800 new cases each year and about 13,600 deaths.

Brain Cancer Tumors can arise from most of the many types of cells that are found in the brain. The vast majority of brain cancers develop for no apparent reason. One of the few established risk factors is ionizing radiation, such as X-rays. Before the risks were recognized, children with ringworm of the scalp (a fungal infection) often received low-dose radiation therapy, which substantially increased their risk of brain tumors later in life. Symptoms are often nonspecific and include headaches, fatigue, behavioral changes, and sometimes seizures. There has been a slight increase in the incidence of tumors over the past 20 years, but this may be due to improved methods of diagnosis. Some brain tumors are curable by surgery or by radiation and chemotherapy, but most are not. Survival time varies depending on the type of the tumor, from one to eight years. In the United States each year there are about 22,900 new cases and 13,700 deaths.

Leukemia Leukemia, cancer of the white blood cells, can affect both children and adults. It starts in the bone marrow but can then spread to the lymph nodes, spleen, liver, other organs, and central nervous system. Like brain cancer, it is a complex disease with many different types and subtypes. Most people with leukemia have no known risk factors. Some possible risk factors include smoking, exposure to radiation and certain chemicals, and infections. Most symptoms occur because leukemia cells crowd out the production of normal blood cells; the result can be fatigue, anemia, weight loss, and increased risk of infection. Treatment and survival rates vary depending on the exact type and other factors. There are about 47,200 new cases and 23,500 deaths each year.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Has anyone you know had cancer? If so, what type of cancer was it? What were its symptoms? Based on the information presented so far in this chapter, did the person have any of the known risk factors for the disease?

Lymphoma Lymphoma begins in the lymph nodes and then may spread to almost any part of the body. There are two types—Hodgkin lymphoma and non-Hodgkin lymphoma (NHL). NHL is the more common and more deadly form of the disease. It is the sixth most common cancer in the United States, with about 70,100 people diagnosed annually and about 18,900 deaths. Risk factors for NHL are not well understood, but people with compromised immune systems are at increased risk, especially when exposed to radiation or certain infections and chemicals. The monoclonal antibody rituximab has greatly improved therapy in the last decade. Survival rates for Hodgkin lymphoma have significantly improved over the past few decades, and there are now about 9,100 cases and 1,200 deaths each year.

Multiple Myeloma Normal plasma cells play an important role in the immune system, producing antibodies. Malignant plasma cells may produce tumors in several sites, particularly in the bone marrow, and when they grow in multiple sites, they are referred to as multiple myeloma (MM). By crowding out normal bone marrow cells, MM can lead to anemia, excessive bleeding, and decreased resistance to infection. Age is the most significant risk factor: most patients diagnosed with MM are over 65 years old. Other risk factors are not well understood, although MM is about twice as common among African Americans as among whites. There are about 21,700 new cases each year and 10,700 deaths.

NEW AND EMERGING CANCER TREATMENTS

Many advances in cancer care have been made over the last 15 years, improving upon the traditional treatments of surgery, radiation, and chemotherapy.

Beyond Traditional Treatments

As more is understood about how cancers develop and grow, new targets have become available that allow more focused therapies with less severe side effects. Some of the specialized treatments that are currently being employed include the following:

- **Proteasome inhibitors.** Proteasomes help control the cell cycle—the process through which cells divide. If proteasomes

malfunction, as is often the case in cancer cells, then cells may begin multiplying out of control. Proteasome inhibitors block the action of proteasomes, halting cell division and killing the cells. Proteasome inhibitors have proven very successful for multiple myeloma and certain other blood cancers and are being explored for other types of cancer.

- **Monoclonal antibodies.** The use of monoclonal antibodies to fight cancer mimics the way the immune system fights an infection. All cells in the body have markers on their surfaces, and the immune system develops antibodies, or special proteins, that can recognize these markers, bind to them, and trigger neutralization and destruction. Scientists carefully select cell surface markers that are displayed on cancer cells and then administer antibodies to the patient. These monoclonal antibodies (the term *monoclonal* means they bind to only one particular cell surface marker) target the cancer cells and enlist the help of the body's own immune system to selectively kill these cells. Rituximab (Rituxan) has been one of the most successful monoclonal antibodies, used effectively for patients with lymphoma. Many other monoclonal antibodies are in use currently, and the list of potential new agents in this category is growing rapidly.

- **Tyrosine kinase inhibitors.** Tyrosine kinases are enzymes that often play important roles in cellular activities, including cell growth, differentiation, and death. Mutations in tyrosine kinases can thereby be another mechanism by which cells can grow out of control. Tyrosine kinase inhibitors bind directly to the site where the enzyme is active, shutting down the out-of-control cell signaling. Imatinib (Gleevec) is one example of a successful tyrosine kinase inhibitor that has drastically improved the way certain leukemias are treated. Other tyrosine kinase inhibitors are currently being used in lung and pancreatic cancers, and many more are being studied for further application.

- **Anti-angiogenesis drugs.** To obtain nutrients, cancer cells signal the body to produce new blood vessels, a process called *angiogenesis*. Bevacizumab (Avastin) was the first angiogenesis inhibitor approved for treatment of cancer in the United States. This occurred as a result of trials with advanced colorectal cancer in which bevacizumab was shown to improve survival when combined with standard chemotherapy agents. Since then, bevacizumab has also shown benefit in non-small cell lung cancer, renal cell cancer, and certain types of brain cancer. Many other angiogenesis inhibitors are currently being developed, and more research is exploring other ways to employ these agents.

- **Biological therapies/immunotherapy.** Biological therapies are based on enhancing the immune system's reaction to a tumor. Techniques include cancer vaccines, genetic modification of the body's immune cells, and the use of genetically engineered cytokines, which enhance immune cell function. Melanomas seem particularly susceptible to these biological approaches. Cancer vaccines are also under study for kidney cancer, lymphoma, lung cancer, and other cancers.

- **Bone marrow/stem cell transplants.** In cancers of the blood-forming cells or lymph cells, treating patients with high doses of chemotherapy and/or radiation to try to rid the body of cancer cells can be effective. However, the elimination of the bone marrow can be lethal, necessitating rescue with **stem cells** that can repopulate the hematopoietic and immune systems. In one type of stem cell transplant, these stem cells are collected from the cancer patient before treatment. In another type of stem cell transplant, the stem cells are collected from a compatible donor. Often siblings can serve as donors, but when no familial match is found, patients can seek unrelated donors through the National Marrow Donor Program (NMDP). This national registry collects cell samples (often via a cheek swab) from volunteers and keeps the information on file. By matching cancer patients with volunteer donors, the NMDP has enabled thousands of cancer patients to be cured of their otherwise often fatal malignancies. For information on joining the registry, see the NMDP website at www.marrow.org.

Experimental Techniques

Many new and exciting possibilities for cancer therapy are on the horizon. Although it is impossible to predict which of these new approaches will be most successful, researchers hope that cancer therapy overall will become increasingly safer and more effective.

- **Gene therapy.** Completion of the sequencing of the human genome in 2000 opened a treasure chest of new insights into cancer. Scientists have already discovered important new subtypes of tumors for breast cancer, melanoma, leukemia, and lymphomas based on patterns of gene expression. **Gene therapy** is the manipulation of gene expression in human cells. Gene therapy offers a potential treatment or cure for cancer, as well as for various genetic diseases. For gene therapy to succeed, new genes must be delivered to defective cells without disturbing the overall functioning of the cells. In the treatment of cancer, gene therapy would “turn off” the genes responsible for causing cells to divide rapidly and become malignant. Using this approach, researchers hope to develop targeted therapies for specific cancers.

- **Enzyme activators/blockers.** Normal cells die after dividing a given number of times. Scientists believe that the enzyme caspase triggers the death of normally functioning cells. In cancer cells, caspase activity may be blocked. Conversely, if

stem cells Unspecialized cells that can divide and produce cells that differentiate into the many different types of specialized cells in the body (brain cells, muscle cells, skin cells, blood cells, and others).

gene therapy The manipulation of gene expression in human cells; offers a potential treatment or cure for cancer by “turning off” the genes responsible for causing cells to divide rapidly and become malignant.

TERMS

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you know how to perform self-examinations, such as breast or testicular self-exams? Has your doctor ever suggested that you do so or given you instructions on proper technique? Given what you know about yourself and your family's medical history, do you think self-exams could be important for you?

the enzyme telomerase becomes active in cancer cells, the life/death cycle stops and the cells duplicate indefinitely. In effect, inactive caspase or active telomerase may make cancer cells “immortal.” Researchers are studying compounds that can either activate caspase or deactivate telomerase; either type of drug might lead cancer cells to self-destruct. Many of these drugs are currently being studied in clinical trials.

Living with Cancer

Nearly 12 million cancer survivors are alive today in the United States. The fear of cancer never disappears, however, and there is always the risk of a recurrence.

Psychological support is an important factor during cancer treatment. For some patients, family and friends plus a caring physician or nurse provide all the support that is necessary. For many people, an organized group can help provide needed social and psychological support. Support groups are also available for friends and family members of cancer patients.

connect™

Connect to Your Choices

Have you ever thought about where you get your behaviors and habits related to cancer? Many factors can influence our behaviors and habits, some not as obvious as others. When you were growing up, was your family aware of cancer risks? Did they make sure you used sunscreen when you were playing outside in the sun? Currently, do the people in your social circle value tanned skin, and do they sunbathe or go to tanning salons? Are you susceptible to images of tanned celebrities in the popular media?

What are the external factors that influence your choices about cancer-related behaviors? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

A growing body of research suggests that we can take an active role in preventing many cancers by adopting a wellness lifestyle.

RIGHT NOW YOU CAN:

- If you are a woman, do a breast self-exam. If you are a man, do a testicular self-exam.
- Buy multiple bottles of sunscreen and put them in places where you will most likely need them, such as your backpack, gym bag, or car.
- Check the cancer screening guidelines in this chapter and make sure you are up-to-date on your screenings.

IN THE FUTURE YOU CAN:

- Learn where to find information about daily UV radiation levels in your area, and learn how to interpret the information. Many local newspapers and television stations (and their websites) report current UV levels every day.
- Gradually add foods with abundant phytochemicals to your diet.

SUMMARY

- Cancer is the abnormal, uncontrolled multiplication of cells; it can cause death if untreated.
- A malignant tumor can invade surrounding structures and spread to distant sites via the blood and lymphatic system, producing additional tumors.
- A malignant cell divides without regard for normal growth. As tumors grow, they produce signs or symptoms that are determined by their location in the body.
- One in two men and one in three women will develop cancer.
- Mutational damage to a cell's DNA can lead to rapid and uncontrolled growth of cells; mutagens include radiation, viral infection, and chemical substances in food and air.
- Cancer-promoting dietary factors include meat, certain types of fats, and alcohol.
- Diets high in fruits and vegetables are linked to a lower risk of cancer.
- Other possible causes of cancer include inactivity and obesity, certain types of infections and chemicals, and radiation.
- Self-monitoring and regular screening tests are essential to early cancer detection.
- Methods of cancer diagnosis include MRI scanning, CT scanning, and ultrasound.
- Treatment methods usually consist of some combination of surgery, chemotherapy, and radiation. Newer therapies such as monoclonal antibodies, tyrosine kinase inhibitors, angiogenesis inhibitors, proteasome inhibitors, biological therapies, and stem cell

transplants have greatly improved outcomes. Research continues to show promise in these and other areas.

- Lung cancer kills more people than any other type of cancer. Tobacco smoke is the primary cause.
- Colon and rectal cancer are linked to age, heredity, obesity, and a diet rich in red meat and low in fruits and vegetables. Most colon cancers arise from preexisting polyps.
- Breast cancer affects about one in eight women in the United States. Although there is a genetic component to breast cancer, diet and hormones are also risk factors.
- Prostate cancer is chiefly a disease of aging; diet and lifestyle probably are factors in its occurrence. Early detection is possible through rectal examinations and PSA blood tests.
- Cancers of the female reproductive tract include cervical, uterine, and ovarian cancer. The Pap test is an effective screening test for cervical cancer.
- Abnormal cellular changes in the epidermis, often a result of exposure to the sun, cause skin cancer, as does chronic exposure to certain chemicals. Skin cancers include basal cell carcinoma, squamous cell carcinoma, and melanoma.
- Head and neck cancers are caused primarily by smoking, excess alcohol consumption, and use of smokeless tobacco.
- Testicular cancer can be detected early through self-examination.

FOR MORE INFORMATION

BOOKS

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Rosenbaum, E., et al. 2008. *Everyone's Guide to Cancer Therapy*, rev. 5th ed. Riverside, NJ: Andrews McMeel. Reviewed by a panel of more than 100 oncologists; provides articles on the known causes, diagnoses, and treatments for many types of cancer.

Turkington, C., and W. LiPera. 2005. *The Encyclopedia of Cancer*. New York: Facts on File. Includes entries on a variety of topics relating to cancer causes, prevention, diagnosis, and treatment.

ORGANIZATIONS, HOTLINES, AND WEBSITES

American Academy of Dermatology. Provides information about skin cancer prevention.

<http://www.aad.org>

American Cancer Society. Provides a wide range of free materials on the prevention and treatment of cancer.

<http://www.cancer.org>

American Institute for Cancer Research. Provides information about lifestyle and cancer prevention, especially nutrition.

<http://www.aicr.org>

Cancer Guide: Steve Dunn's Cancer Information Page. Links to many good cancer resources on the Internet and advice about how to make best use of the information.

<http://www.cancerguide.org>

Clinical Trials. Information about clinical trials for new cancer treatments can be accessed at the following sites:

<http://www.cancer.gov/clinicaltrials>

<http://www.centerwatch.com>

EPA/Sunwise. Information about the UV index and the effects of sun exposure, with links to sites with daily UV index ratings for cities in the United States and other countries.

<http://www.epa.gov/sunwise/uvindex.html>

Harvard School of Public Health: Disease Risk Index. Includes interactive risk assessments as well as tips for preventing common cancers.

<http://www.diseaseriskindex.harvard.edu/update>

MedlinePlus Cancer Information. Provides news and links to reliable information on a variety of cancers and cancer treatment.

<http://www.nlm.nih.gov/medlineplus/cancers.html>

National Cancer Institute. Provides information about treatment options, screening, and clinical trials.

<http://www.cancer.gov>

National Comprehensive Cancer Network (NCCN). Presents treatment guidelines for physicians and patients related to the treatment of various cancers; these guidelines were developed by a group of leading cancer centers.

<http://www.nccn.org>

National Toxicology Program. The federal program that creates regular reports listing the substances that are known or reasonably assumed to cause cancer in humans.

<http://ntp-server.niehs.nih.gov>

Oncolink/The University of Pennsylvania Cancer Center Resources. Contains information about different types of cancer and answers to frequently asked questions.

<http://www.oncolink.org>

See also the listings in Chapters 10–14.

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BEHAVIOR CHANGE STRATEGY

Incorporating More Fruits and Vegetables into Your Diet

When we think about the health benefits of fruits and vegetables, we usually focus on the fact that they are rich in carbohydrates, dietary fiber, and vitamins and low in fat. A benefit that we may overlook is that they contain specific cancer-fighting compounds (phytochemicals) that help slow, stop, or even reverse the process of cancer. The National Cancer Institute (NCI) reports that people who eat five or more servings a day of fruits and vegetables have half the risk of cancer of those who eat fewer than two; according to the NCI, seven to nine servings or more per day are optimal.

Most Americans need to double the amount of fruits and vegetables they eat every day. Begin by monitoring your diet for one or two weeks to assess your current intake; then look for ways to incorporate these foods into your diet in easy and tasty ways. Here are some tips to get you started.

Breakfast

- Drink pure fruit juice every morning.
- Add raisins, berries, or sliced fruit to cereal, pancakes, or waffles. Top bagels with tomato slices.
- Try a fruit smoothie made from fresh or frozen fruit and orange juice or low-fat yogurt.

Lunch

- Choose vegetable soup or salad with your meal.
- Replace potato chips or french fries with cut-up vegetables.
- Add extra chunks of fruits or vegetables to salads.
- Add vegetables such as roasted peppers, cucumber slices, shredded carrots, avocado, or salsa to sandwiches.
- Drink tomato or vegetable juice instead of soda (watch for excess sodium).

Dinner

- Choose a vegetarian main course, such as stir-fry or vegetable stew. Have at least two servings of vegetables with every dinner.
- Microwave vegetables and sprinkle them with a little bit of Parmesan cheese.
- Substitute vegetables for meat in casseroles and pasta and chili recipes.
- At the salad bar, pile your plate with healthful vegetables and use low-fat or nonfat dressing.

Snacks and On the Go

- Keep ready-to-eat fruits and vegetables on hand (apples, plums, pears, and carrots).

- Keep small packages of dried fruit in the car (try dried apples, apricots, peaches, pears, and raisins).
- Make ice cubes from pure fruit juice and drop them into regular or sparkling water.
- Freeze grapes for a cool summer treat.

The All-Stars

Different fruits and vegetables contribute different vitamins, phytochemicals, and other nutrients, so be sure to get a variety. The following types of produce are particularly rich in nutrients and phytochemicals:

- Cruciferous vegetables (broccoli, cauliflower, cabbage, bok choy, brussels sprouts, kohlrabi, turnips, etc.).
- Citrus fruits (oranges, lemons, limes, grapefruit, tangerines, etc.).
- Berries (strawberries, raspberries, blueberries, etc.).
- Dark green leafy vegetables (spinach, chard, collards, beet greens, kale, mustard greens, romaine and other dark lettuces, etc.).
- Deep yellow, orange, and red fruits and vegetables (carrots, pumpkin, sweet potatoes, winter squash, red and yellow bell peppers, apricots, cantaloupe, mangoes, papayas, etc.).

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Immunity and Infection

LOOKING AHEAD...

After reading this chapter, you should be able to

- Identify the body's physical and chemical barriers to infection
- Explain how the immune system responds to an invading microorganism
- Describe the step-by-step process by which infectious diseases are transmitted
- Identify the major types of pathogens and describe the common diseases they cause
- Discuss steps you can take to prevent infections and strengthen your immune system

TEST YOUR KNOWLEDGE

1. Which of the following can transmit disease-causing pathogens (such as bacteria or viruses) from one person to another?
 - a. Mosquitoes
 - b. Doorknobs
 - c. Soil
2. When taking a prescription antibiotic, you should always finish all the medication, even if you start feeling better before running out of medicine. True or false?
3. Which of the following can recognize and eliminate specific microbes (such as bacteria) that invade the body?
 - a. Antigens
 - b. Antibodies
 - c. Antidotes
4. Patients rarely catch bacterial infections in hospitals. True or false?
5. You can reduce your chances of getting sick by doing which of the following?
 - a. Washing your hands frequently
 - b. Keeping your immunizations up-to-date
 - c. Getting enough sleep

ANSWERS

1. **ALL THREE.** Pathogens can be transmitted directly (by contact with a sick person) or indirectly (by contact with an infected animal or insect or a contaminated object like a doorknob).
2. **TRUE.** Failing to take all your medication can lead to a relapse of the illness; taking antibiotics incorrectly also contributes to the development of antibiotic-resistant bacteria.
3. **B.** Antibodies are specialized proteins produced by the immune system, which can target specific invading organisms.
4. **FALSE.** Thousands of people die each year from infections contracted in health care settings.
5. **ALL THREE.** Frequent hand washing prevents the spread of many disease-causing agents. Immunizations prime the body to tackle an invading organism. Sleep helps support a healthy immune system.

Countless microscopic organisms live around, on, and in us. Although most microbes are beneficial, many of them can cause **infections** and infectious diseases. But the constant vigilance of our immune system keeps them at bay and our bodies healthy. The immune system protects us not just from **pathogens** but also from cancer.

In the past decade, issues related to immunity have been in the news because of the threat of pandemic influenza, whether “swine flu,” “bird flu,” or some other form of flu. This threat, along with the reemergence of old scourges such as tuberculosis, makes it especially important that we understand both the

immune system and the pathogens that can cause us harm. This chapter introduces you to the mechanisms of immunity and infection, as well as strategies for keeping yourself well in a world of disease-causing microorganisms.

THE BODY'S DEFENSE SYSTEM

Our bodies have very effective ways of protecting themselves against invasion by foreign organisms. The immune system is the body's collective set of defenses that includes surface barriers as well as the specialized cells, tissues, and organs that carry

out the immune response. The first line of defense is a formidable array of physical and chemical barriers. When these barriers are breached, cellular processes of the immune system come into play. Together these defenses provide an effective response to nearly all the invasions our bodies experience.

Physical and Chemical Barriers

The skin, the body's largest organ, prevents many microorganisms from entering the body. Although many bacterial and fungal organisms live on the surface of the skin, few can penetrate it except through a cut or break.

Wherever there is an opening in the body, or an area without skin, other barriers exist. All body cavities and passages that are exposed to the external environment are lined with mucous membranes, which secrete mucus and contain cells designed to prevent the passage of unwanted organisms and particles. This includes the mouth, nostrils, eyelids, bronchioles, vagina, and other organs of the respiratory, digestive, and urogenital tracts. The surface of both skin and mucous membranes is made of epithelial tissue, which consists of one or more layers of closely packed cells with almost no space between cells. The fluids that cover epithelial tissue, such as tears, saliva, and vaginal secretions, are rich in enzymes and other proteins that break down and destroy many microorganisms.

The respiratory tract is lined not only with mucous membranes but also with cells having hairlike protrusions called *cilia*. The cilia sweep foreign matter up and out of the respiratory tract. Particles that are not caught by this mechanism may be expelled from the system by a cough.

The Immune System: Cells, Tissues, and Organs

Beyond surface barriers, the **immune system** operates through a remarkable information network involving billions of cellular defenders that rush to protect the body when a threat arises. The immune system can be thought of as two systems—the innate immune system, which you are born with, and the adaptive immune system, which you acquire over time as you are exposed to microorganisms. The innate immune system is nonspecific; that is, it launches the same kind of defense regardless of the type of invading microorganism. The adaptive immune system is very specific, operating through mechanisms that work like a lock and key. The complete elimination of a pathogen involves the coordinated activities of both systems.

The immune system works through the action of different types of white blood cells, which are continuously produced in the bone marrow. A key feature of these cells is that they can distinguish foreign cells from the body's own cells.

Cells of the Innate Immune System The cells of the innate immune system recognize pathogens as “foreign” and kill them, but they cannot develop a memory of these pathogens.

The immune system has a remarkable ability: it can distinguish foreign cells from the body's own cells.



Dendritic cells are white blood cells that engulf foreign cells and display their antigens, thereby activating T and B cells. The dendritic cell shown in this scanning electron micrograph is magnified 2700 times.

Thus they respond the same way no matter how many times a pathogen invades.

- **Neutrophils**, one type of white blood cell, travel in the bloodstream to areas of invasion, attacking and ingesting pathogens.
- **Eosinophils**, white blood cells that occur in mucosal tissues such as those in the gastrointestinal tract and the mammary glands, provide innate immunity to certain microbes.
- **Macrophages**, or “big eaters,” act as scavengers, devouring pathogens and worn-out cells.
- **Natural killer cells** directly destroy virus-infected cells and cells that have turned cancerous.
- **Dendritic cells**, which reside in tissues, engulf pathogens and activate lymphocytes.

Cells of the Adaptive Immune System The cells of the adaptive immune system are white blood cells called **lymphocytes**. The two main types of lymphocytes are **T cells** and

infection Invasion of the body by a microorganism.

pathogen A microorganism that causes disease.

immune system The body's collective system of defenses that includes surface barriers as well as the specialized cells, tissues, and organs that carry out the immune response.

lymphocyte A type of white blood cell that carries out important functions in the immune system.

T cell A type of lymphocyte with specific immune system functions; T cells arise in bone marrow and mature in the thymus (thus the name).

TERMS

B cells, which differ in function. Whereas cells of the innate immune system can recognize a cell as foreign, lymphocytes are capable of exquisite specificity and of immunological memory.

Antigens and Antibodies All of your body cells display markers on their surface that identify them as “self” to lymphocytes. Invading microbes also display markers, and these markers identify them as foreign, or “nonself,” to lymphocytes. Nonself markers that trigger an immune response are known as **antigens**.

Antibodies are specialized proteins that circulate in your bloodstream and are present in most body fluids. Produced by white blood cells, they have complementary markers on their surface that work with antigens like a lock and key, allowing them to recognize and neutralize specific microbes. When an antibody encounters an antigen with a complementary pattern, it locks onto it and neutralizes it or tags it for attack by immune system cells.

T Cells and B Cells When a B cell or T cell encounters the antigen for which it is specific, it proliferates, producing many more lymphocytes that are specific to the same antigen. These daughter cells then differentiate into cells with specific immune functions and attack the invading organisms. B cells become plasma cells that secrete antibodies. T cells differentiate into helper T cells, killer T cells, or suppressor T cells (also called regulatory T cells.) Some B and T cells become memory B and T cells, which can mount a rapid and powerful response should they encounter the same invader months or even years in the future.

The Inflammatory Response When injured or infected, the body reacts by producing an inflammatory response. Macrophages, dendritic cells, and other specialized cells in the area of invasion or injury release **histamine** and other substances that cause blood vessels to dilate and fluid to flow out of capillaries into the injured tissue. This produces increased heat, swelling, and redness in the affected area. White blood cells are drawn to the area and attack the invaders, in many cases destroying them. This is the immune response, as described in the next section. At the site of infection there may be *pus*—a collection of dead white blood cells and debris resulting from the encounter.

The Immune Response The immune response can be thought of as happening in four phases (Figure 17.1).

- **Phase 1: Recognition.** Dendritic cells are drawn to the site of the injury and consume the foreign cells. They then migrate to nearby lymphoid tissue, where they activate T cells by displaying the foreign cells’ antigen on their surfaces. Natural killer cells and other early responders destroy infected cells.

- **Phase 2: Proliferation.** Helper T cells specific to the antigen multiply rapidly and stimulate the proliferation of killer T cells and B cells. Cytokines, which are chemical messengers secreted by lymphocytes and other cells of the

immune system, help regulate and coordinate the immune response.

- **Phase 3: Elimination.** Killer T cells strike at foreign cells and infected body cells, identifying them by the antigens displayed on the cell surfaces. Puncturing the cell membrane, they sacrifice body cells in order to destroy the foreign organism within. This type of action is known as a *cell-mediated immune response* because the attack is carried out by cells. Killer T cells also trigger an amplified inflammatory response and recruit more macrophages to help clean up the site.

B cells work in a different way. They produce large quantities of antibody molecules, which are released in the bloodstream and tissues. Antibodies bind to antigen-bearing targets and mark them for destruction by macrophages. This type of response is known as an *antibody-mediated immune response*. Antibodies work against bacteria, viruses, and other substances outside of cells. Cells of the innate immune system then eliminate the antibody-marked pathogens.

- **Phase 4: Slowdown.** Regulatory molecules and suppressor T cells inhibit lymphocyte proliferation and induce lymphocyte death, causing a slowdown of activity; this process restores “resting” levels of B and T cells. Some memory T and B cells remain in the body, where they can initiate a rapid response if the same pathogen reappears in the future.

Immunity After an infection, survival often confers **immunity**; that is, an infected person will not be susceptible to the same pathogen again. This is because some of the lymphocytes created during phase 2 of the immune response are reserved as memory T and B cells. As part of the acquired immune response, they continue to circulate in the blood and lymphatic system for years or even for the rest of the person’s life. If the same antigen enters the body again, the memory T and B cells recognize and destroy it before it can cause illness. This subsequent response takes only a few days to initiate and prevents illness. The ability of memory lymphocytes to remember previous infections is known as **acquired immunity**.

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B cell A type of lymphocyte with specific immune system functions; B cells mature in the bone marrow and produce antibodies.

antigen A marker on the surface of a foreign substance that immune system cells recognize as nonself; a foreign antigen’s presence in the body triggers the immune response.

antibody A specialized protein, produced by white blood cells, that can recognize and neutralize specific microbes.

histamine A chemical responsible for the dilation and increased permeability of blood vessels in the inflammatory response.

immunity Resistance to infection.

acquired immunity The body’s ability to mobilize the cellular memory of an attack by a pathogen to prevent subsequent illness; acquired through the normal immune response and through vaccination.

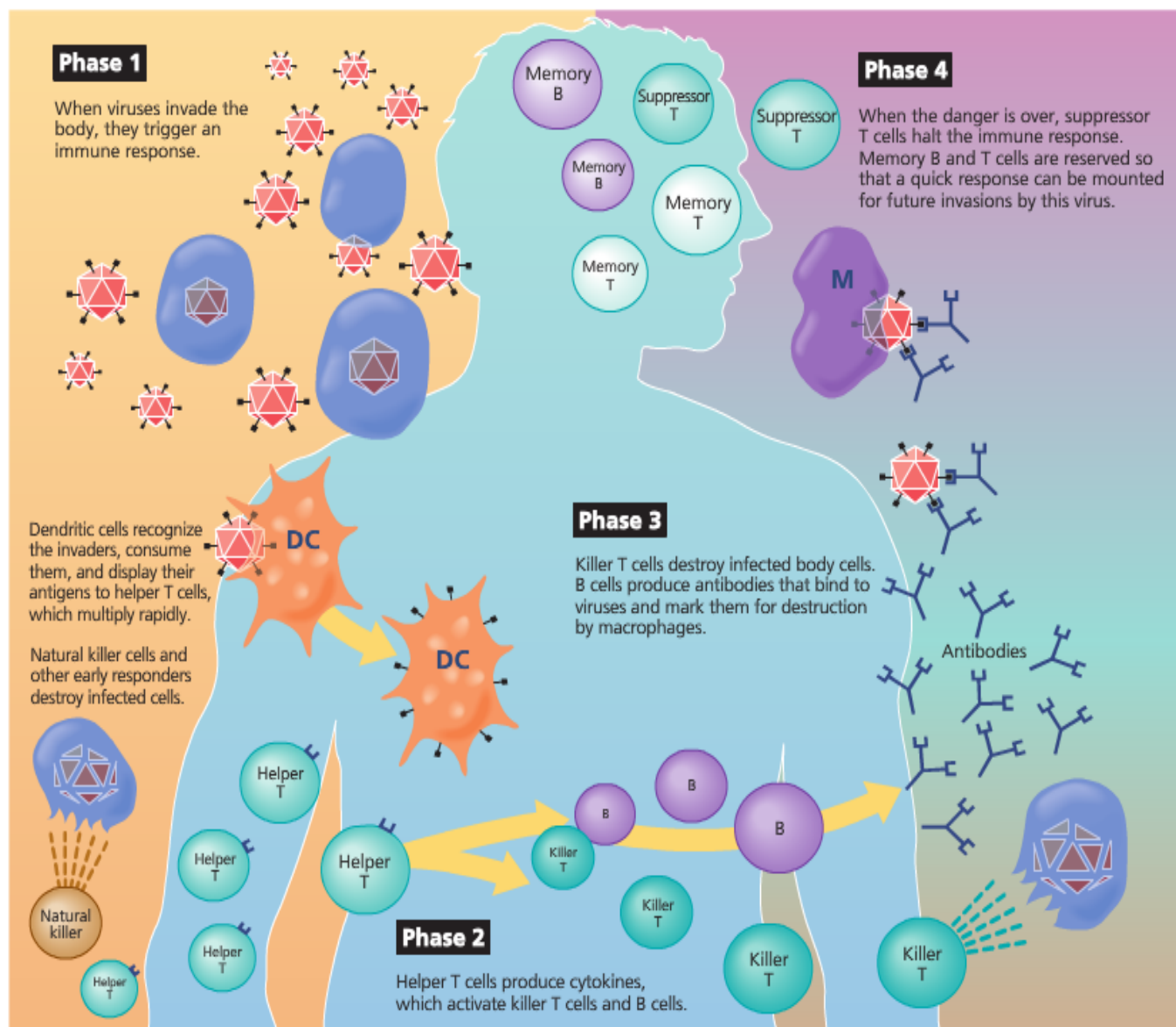


FIGURE 17.1 The immune response. Once invaded by a pathogen, the body mounts a complex series of reactions to destroy the invader. Pictured here are the phases of the immune response as the body responds to a virus.

The Lymphatic System The lymphatic system consists of a network of vessels that carry a clear fluid called lymph; it also includes organs and structures, including the spleen and the lymph nodes, that function as part of the immune system (Figure 17.2). The lymphatic vessels pick up excess fluid from body tissues; the fluid passes through the lymph nodes, where macrophages and dendritic cells congregate. They help clear the fluid of debris and pathogens. Lymph nodes are also the sites where T cells and B cells are activated. When these nodes are actively involved in fighting an infection, they fill with cells. Physicians use the location of swollen lymph nodes as a clue to an infection's location and cause.

QUICK STATS

27 common diseases can be prevented by vaccines.

—CDC, 2012

Immunization

The ability of the immune system to remember previously encountered organisms and retain its strength against them is the basis for **immunization**. When a person is immunized, the immune system is primed with an antigen similar to the pathogenic organism but not as dangerous. The body responds by producing antibodies, which prevent serious infection if the person is exposed to the disease organism.

Immunization The process of conferring immunity to a pathogen by administering a vaccine.

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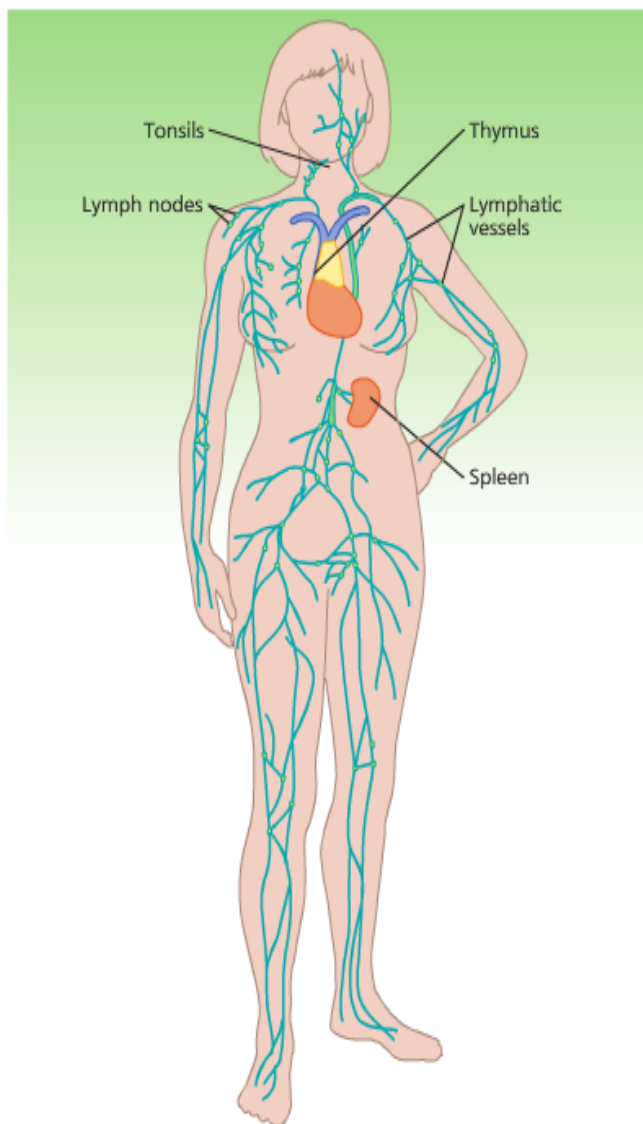


FIGURE 17.2 The lymphatic system. The lymphatic organs are production centers for infection-fighting cells and sites for some immune responses.

itself. The preparations used to manipulate the immune system are known as **vaccines**. (Table 17.1 lists the currently recommended immunization schedule for children and adults; Table 17.2 lists the recommendations for teens and college students.)

Types of Vaccines Vaccines can be made in several ways. In some cases, microbes are cultured in the laboratory in a way that attenuates (weakens) them. These live, attenuated organisms are used in vaccines against diseases such as measles, mumps, and rubella (German measles). In other cases, when it is not possible to breed attenuated organisms, vaccines are made from pathogens that have been killed in the laboratory but that still retain their ability to stimulate the production of antibodies. Vaccines composed of killed viruses are used against influenza viruses, among others.

Vaccines confer *active immunity*, meaning that the vaccinated person produces his or her own antibodies to the microorganism. This contrasts with *passive immunity*, which is

conferred by injecting antibodies produced by other human beings or animals who have recovered from a given disease. Gamma globulin, a product made from the blood plasma of many individuals containing all the antibodies they have ever made, can provide a rapid but temporary immunity to a particular disease, or it can be used to treat antibody deficiency syndromes. Passive immunity does not confer memory and provides only short-term protection against a pathogen.

Immunization Concerns Potential shortages and safety are areas of concern related to vaccines. In addition, some Americans wonder if vaccinations are worthwhile.

VACCINE SHORTAGES Vaccines are occasionally in short supply, and vaccination may be limited at first to high-risk groups when shortages occur. Contributing factors include insufficient vaccine stockpiles, manufacturing and production problems, and the limited number of companies involved in vaccine production. Vaccines are expensive to develop and produce, carry high liability, and return relatively low profits. The influenza vaccine, which must be changed each year to match the viral strains in circulation and takes months to produce, may be particularly vulnerable to supply problems.

VACCINE SAFETY Side effects from immunization are usually mild, such as soreness at the injection site. It is estimated that an allergic reaction may occur in 1 in 1.5 million doses. Any risk from vaccines must be balanced against the risk posed by the diseases they prevent; for example, the death rate from diphtheria is about 5–10%.

The CDC monitors reports of adverse reactions to vaccines, and new formulations or types of vaccines are being developed to increase safety. For example, oral polio vaccine, which contains live but weakened polio virus, has been replaced by inactivated polio virus, which contains killed virus. The oral vaccine is somewhat more effective, but in about 1 in 2.4 million cases, it causes polio; because of the low risk for polio in the United States, the oral vaccine is no longer used.

Herd Immunity and Vaccine Controversies Universal or near-universal immunization is necessary to reduce both individual and community risk of communicable diseases. However, it is not necessarily essential that every member of a given community be immunized against a given disease. This is because immunization reduces the prevalence and spread of the disease throughout the entire community, lowering the risk that a disease will be able to get a foothold. This phenomenon is referred to as **herd immunity**.

vaccine A preparation of killed or weakened microorganisms, inactivated toxins, or components of microorganisms that is administered to stimulate an immune response; a vaccine protects against future infection by the pathogen.

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herd immunity A type of immunity that occurs when a significant proportion of a community has been vaccinated against a disease and that immunity confers protection on unvaccinated individuals.

Table 17.1**Immunizations for Children and Adults**

VACCINE	PEOPLE FOR WHOM IMMUNIZATION IS RECOMMENDED
Diphtheria	All children (DTaP vaccine in four doses at 2, 4, 6, and 15 months of age); booster shots recommended every 10 years
H. influenzae type b (Hib)	All children (protects against meningitis; recommended initial immunization beginning at 2 months); older children and adults who have had a splenectomy or bone marrow transplant, have sickle cell disease, leukemia, or HIV/AIDS, or are undergoing immunosuppressant drug therapy; also at risk are household contacts and day care classmates. American Indian/Alaska Native populations also have increased risk
Hepatitis A	All children at age 1 year; injection drug users, men who have sex with men, people with clotting factor disorder or chronic liver disease, travelers to certain countries, and others at risk; unvaccinated people who may come into close contact with an international adoptee
Hepatitis B	All children (at birth, if possible) and unvaccinated adolescents; adults at risk, including health care workers, household contacts and sex partners of infected people, injection drug users, people with HIV or another STD, adults who have more than one sex partner, and men who have sex with men
Human papillomavirus (HPV)	Girls age 11–12; may be given to girls as young as 9 and women through age 26 (three doses); the quadrivalent HPV vaccine may also be given to males ages 9–26 years of age to reduce the likelihood of acquiring HPV-caused genital warts
Influenza (seasonal)	Annual vaccination for all people aged 6 months and older
Measles and mumps	All children (MMR vaccine administered in two doses at 12 months and 4–6 years of age); unvaccinated adults born after 1957 who are not immune (those who received only one dose or were vaccinated between 1963 and 1967 may need revaccination); people in high-risk groups; during outbreaks, health care personnel without evidence of vaccination should be vaccinated
Meningococcal conjugate	All children at age 11–18 years or at high school entry, unvaccinated first-year college students living in dormitories, military recruits, and others at increased risk
Pertussis (whooping cough)	All children (DTaP vaccine in four doses at 2, 4, 6, and 15 months of age); booster shots recommended every 10 years
Pneumococcal polysaccharide	Adults aged 65 and older; anyone with chronic heart or lung disease or with no functional spleen; others at high risk, including Alaska Natives and certain American Indian groups
Pneumococcal conjugate	All children (in four doses given at 2, 4, 6 and 12 months of age); people with chronic illness, including chronic heart, lung, kidney, or liver disease, diabetes, HIV/AIDS, sickle cell disease; anyone with a suppressed immune system
Polio	All children (given in three doses at 2, 4, and 6 months of age); adults at risk, including certain laboratory and health care workers, and travelers to polio-endemic countries
Rotavirus	All children aged 6 weeks to 8 months (generally given in three doses at 2, 4, and 6 months of age)
Rubella (German measles)	All children (MMR vaccine administered in two doses at 12 months and 4–6 years of age); unvaccinated adults who are not immune, especially women; during outbreaks, health care personnel without evidence of vaccination should be vaccinated
Tetanus (lockjaw)	All children (DTaP vaccine in four doses at 2, 4, 6, and 15 months of age); booster shots recommended every 10 years (sooner if more than 5 years have elapsed since the previous booster and the individual has a contaminated wound)
Varicella-zoster (chicken pox)	Children over age 12 months (two doses with the first at 12–15 months and the second at 4–6 years of age); unvaccinated adolescents and adults who have not had chicken pox
Zoster (shingles)	Unvaccinated people ages 60 and older, regardless of their history of chicken pox or shingles

For international travelers, all standard childhood immunizations should be up-to-date and additional vaccines considered. Further information is available from the CDC's National Immunization Program (800-232-2522; <http://www.cdc.gov/vaccines/>) and the CDC's Travel Information (877-394-8747; <http://www.cdc.gov/travel>).

SOURCES: Centers for Disease Control and Prevention. 2012. *Immunization Schedules* (<http://www.cdc.gov/vaccines/recs/schedules/default.htm>); *Morbidity and Mortality Weekly Report* 59(20) 630–632; Prevention and control of influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2011 *MMWR* 60(33) 1128–1132; Adult vaccination coverage—United States 2010. *Morbidity and Mortality Weekly Report* 61: 66–72 (February 3, 2012).

Table 17.2**Immunizations Recommended for Teens and College Students**

VACCINE	SCHEDULE
Human papilloma virus (HPV)	Quadrivalent vaccine (HPV4) for prevention of cervical, vaginal, and vulvar cancers (females) and genital warts (males and females); first dose at 11–12 years; second dose 1–2 months after first dose; third dose 6 months after first dose
Influenza (seasonal)	Annual vaccination
Measles-mumps-rubella (MMR)	Two doses (at least 28 days apart) for previously unvaccinated people; one dose for those who previously received only one immunization
Meningococcal conjugate	Previously unvaccinated college freshmen living in dormitories (one dose)
Tetanus-diphtheria-pertussis (DTaP)	People 13–18 years of age who have not received DTaP
Varicella (chicken pox)	Two doses (at least 28 days apart) for previously unvaccinated people; one dose for those who previously received only one immunization

SOURCE: Centers for Disease Control and Prevention. 2012. *Immunization Schedules for Adults* (<http://www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm#hcp>).

In recent years, increasing numbers of parents have been refusing to allow their children to receive recommended immunizations, relying instead on herd immunity for protection from disease. Many parents fear the side effects of vaccinations, believing the risks of immunization are greater than the risks of the illnesses prevented by the immunization. Many parents also object to the large number of recommended immunizations. Because of some now-discredited research, some people believe there is a possible link between vaccines and autism. In 2010 the medical journal *Lancet* retracted a controversial paper that claimed to show a link between the measles/mumps/rubella vaccine and autism, citing serious methodological problems in the study. Many people are still under the impression that this research was valid. In addition, the mercury-containing preservative thimerosal used in some vaccines came under fire as a cause of autism, but no clear link was ever found between thimerosal-containing vaccines and autism. Thimerosal was removed from pediatric vaccines beginning in 1999.

People who rely on herd immunity are actually undermining it. With fewer immunizations in a community, herd immunity erodes, allowing outbreaks of infectious diseases to occur. This is believed to be the case in outbreaks of meningitis, measles, mumps, and whooping cough (pertussis) across the country in the last decade.

Allergy: The Body's Defense System Gone Haywire

An estimated 50 million Americans are affected by **allergies**. Allergies result from a hypersensitive and overactive immune system. The immune system reacts to a harmless substance

such as pollen or animal dander as if it were a harmful pathogen. For the most part, allergy symptoms—stuffy nose, sneezing, wheezing, skin rashes, and so on—are the result of the immune response.

Allergens Substances that provoke allergies are known as **allergens**; they may cause a response if they are inhaled or swallowed or if they come in contact with the skin. Different people have allergic reactions to different substances, but more than half of Americans aged 6–59 react to at least one common allergen. Common allergens include the following:

- **Pollen:** Referred to as hay fever or allergic rhinitis, pollen allergies are widespread. Weeds, grasses, and trees are common producers of allergenic pollen.
- **Animal dander:** People with animal allergies are usually allergic not to fur but to dander (dead skin flakes), urine, or a protein found in saliva. Allergies to mice, dogs, and cats are common.
- **Dust mites and cockroaches:** The droppings of cockroaches and microscopic dust mites can trigger allergies. Mites live in carpets, upholstered furniture, and bedding.
- **Molds and mildew:** The small spores produced by these fungi can trigger allergy symptoms. Molds and mildew thrive in damp areas of buildings.
- **Foods:** The most common food allergens in adults include peanuts, tree nuts, fish, and shellfish.
- **Insect stings:** The venom of insects such as yellow jackets, honeybees, hornets, paper wasps, and fire ants causes allergic reactions in some people.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your views on government-required child vaccinations? What has shaped your views on this issue?



allergy A disorder caused by the body's exaggerated response to foreign chemicals and proteins; also called *hypersensitivity*.

allergen A substance that triggers an allergic reaction.

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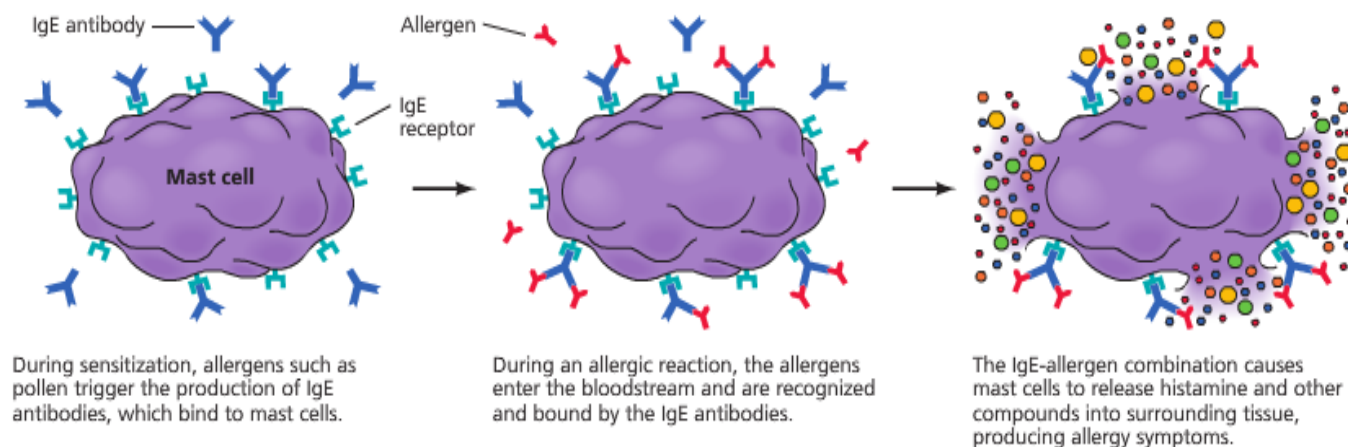


FIGURE 17.3 The allergic response.

People may also be allergic to certain medications, plants such as poison oak, latex, metals such as nickel, and compounds found in cosmetics.

The Allergic Response Most allergic reactions are due to the production of a special type of antibody known as *immunoglobulin E (IgE)*. Initial exposure to a particular allergen may cause little response, but it sensitizes the immune system by causing the production of allergen-specific IgE, which binds to mast cells (Figure 17.3). Mast cells are part of the immune system and play a role in healing, the immune response, and allergic reactions. When the body is subsequently exposed to the allergen, the allergen binds to IgE, causing the mast cells to release large amounts of histamine and other compounds into surrounding tissues.

Histamine has many effects, including increasing the inflammatory response and stimulating mucus production. The precise symptoms depend on what part of the body is affected. In the nose, histamine may cause congestion and sneezing; in the eyes, itchiness and tearing; in the skin, redness, swelling, and itching; in the intestines, bloating and cramping; and in the lungs, coughing, wheezing, and shortness of breath. In some people, an allergen can trigger an **asthma** attack (see the box “Poverty, Ethnicity, and Asthma”). Symptoms often occur immediately, within minutes of exposure, but inflammatory reactions may take hours or days to develop and then may persist for several days.

The most serious, but rare, kind of allergic reaction is **anaphylaxis**, which results from a release of histamine throughout the body. Anaphylactic reactions can be life-threatening because symptoms may include swelling of the throat, extremely low blood pressure, fainting, heart arrhythmia, and seizures. Anaphylaxis is a medical emergency, and treatment requires immediate injection of epinephrine. People at risk for anaphylaxis should wear medical alert

identification and keep self-administrable epinephrine readily available.

Dealing with Allergies If you suspect you might have an allergy, visit your physician or an allergy specialist. There are three general strategies for dealing with allergies:

- **Avoidance:** You may be able to avoid or minimize exposure to allergens by changing your environment or behavior. For example, removing carpets from the bedroom and using special bedding can reduce dust mite contact. Pollen exposure can be limited by avoiding outdoor activities during peak pollination times, keeping windows shut, and showering and changing clothes following outdoor activities. If you can't part with a pet, keep pets out of bedrooms and frequently vacuum or damp-mop floors.
- **Medication:** A variety of medications are available for allergy sufferers. Many over-the-counter antihistamines are effective at controlling symptoms such as blocked nasal, sinus, or middle ear passages. Prescription corticosteroids delivered by aerosol markedly reduce allergy symptoms, increase effectiveness, and help limit systemic absorption and side effects.
- **Immunotherapy:** Referred to as “allergy shots,” immunotherapy desensitizes a person to a particular allergen through the administration of gradually increasing doses of the allergen over a period of months or years.

QUICK

STATS

About 1 in 10 children and 1 in 8 adults had asthma in 2009.

—CDC, 2012

asthma A disease in which chronic inflammation and periodic constriction of the airways cause wheezing, shortness of breath, and coughing.

anaphylaxis A severe systemic hypersensitive reaction to an allergen characterized by difficulty breathing, low blood pressure, heart arrhythmia, seizure, and sometimes death.

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DIVERSITY MATTERS

Poverty, Ethnicity, and Asthma

Asthma is caused by both chronic inflammation of the airways and spasm of the muscles surrounding the airways. The spasm causes constriction, and the inflammation causes the airway linings to swell and secrete extra mucus, which further obstructs the passages. The symptoms of asthma—wheezing, tightness in the chest, shortness of breath, and coughing—may be mild and occur only occasionally, or they may be severe and occur daily.

An asthma attack is initiated by an irritating stimulus in the bronchial tubes. The stimulus may be an inhaled allergen, such as pollen, dust mites, mold, animal dander, or cockroach droppings, or it can be a nonallergen stimulus, such as exercise, cold air, pollutants, tobacco smoke, infection, or stress. In women with asthma, hormonal changes that occur as menstruation starts may increase vulnerability to attacks. Both environmental and genetic factors contribute to the development of asthma.

Patterns and Prevalence

In 2009 asthma affected 24.6 million people in the United States (17.5 million adults and 7.1 million children under 18), or 8.2% of the population. Since 1980 the number of Americans with asthma has been steadily increasing, despite better treatments and cleaner air.

The prevalence of asthma is higher among children, women, African Americans, Puerto Ricans, and people whose family income is below the poverty line. African Americans are four times more likely to be hospitalized with asthma than other ethnic groups and five times more likely to die from it. People with low incomes are especially at risk; they are more often exposed to the environmental factors that contribute to asthma, such as air pollutants, allergens indoors, and air pollution from highways, incinerators, and waste facilities outdoors. Low-income groups are also less likely to have access to health care.



Treatment and Prevention of Attacks

The symptoms of an asthma attack can be relieved by the use of a bronchodilator—a fast-acting medication, delivered through an inhaler, that opens the airways. Inhaled corticosteroids and other prescribed medications are needed to treat the underlying inflammation of the airways. People with asthma can monitor their condition by self-testing their peak air flow, the speed at which they can exhale, using a special device; a drop in peak air flow can signal an upcoming attack.

Some simple measures can help people avoid allergens and triggers. These include using HEPA filters in vacuum cleaners and room air purifiers, covering mattresses and pillows with special covers, avoiding tobacco smoke, and using professional pest control.

SOURCES: Akinbami, L. J., J. E. Moorman, and X. Liu. 2011. Asthma prevalence, health care use, and mortality: United States, 2005–2009. *National Health Statistics Reports* 32, January 12 (<http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf>); Centers for Disease Control and Prevention. 2011. CDC health disparities and inequalities report, United States, 2011. *Morbidity and Mortality Weekly Report*, Supplement, 60 (<http://www.cdc.gov/mmwr/pdf/other/su6001.pdf>).



THE SPREAD OF DISEASE

The immune system is operating at the cellular level at all times, maintaining its vigilance when you're well and fighting invaders when you're sick. How does it all feel to you, the host for these activities? And how do diseases spread from one person to another, sometimes resulting in epidemics or pandemics? These questions are addressed in this section.

Symptoms and Contagion

The symptoms you experience during an illness are related to the phase of infection and the actions of your immune system. During the first phase of infection, **incubation**, when viruses or bacteria are actively multiplying before the immune system has gathered momentum, you may not have any

symptoms of the illness, but you may be contagious. During the second and third phases of the immune response, you may still be unaware of the infection, or you may “feel a cold coming on.” Symptoms first appear during the *prodromal period*, which follows incubation. If you have acquired immunity, the infection may be eradicated during the incubation period or the prodromal period. In this case it does not develop into a full-blown illness.

Many symptoms of an illness are actually due to the body's immune response rather than to the actions or products of the invading organism. For example, fever is caused by the release

Incubation The period when bacteria or viruses are actively multiplying inside the body's cells; usually a period without symptoms of illness.

TERMS

of certain cytokines by macrophages and other cells during the immune response. These cytokines travel in the bloodstream to the brain and cause the body's thermostat to be reset to a higher level. The resulting elevated temperature helps the body fight against pathogens by enhancing immune responses. (During an illness, it is necessary to lower a fever only if it is uncomfortably high [over 101.5°F] or if it occurs in an infant who is at risk for seizures from fever.) Similarly, you get a runny nose when your lymphocytes destroy infected mucosal cells, leading to increased mucus production. The malaise and fatigue of the flu are caused by pro-inflammatory cytokines.

You may be contagious before you experience any symptoms, and you are contagious as long as your body is releasing infectious microbes. This means that you can transmit an illness without knowing you're infected or catch an illness from someone who doesn't appear to be sick. On the other hand, your symptoms may continue after the pathogens have been mostly destroyed, when you are no longer infectious.

The Chain of Infection

Infectious diseases are transmitted from one person to another through a series of steps—a chain of infection (Figure 17.4). New infections can be prevented by interfering with any step in this process.

Links in the Chain The chain of infection has six major links:

1. **Pathogen:** The infectious disease cycle begins with a pathogen. Many pathogens cause illness by invading body cells; others cause illness by producing toxins that harm tissue.
2. **Reservoir:** The pathogen has a natural environment—called a **reservoir**—in which it typically lives. This reservoir can be a person, an animal, or an environmental space like soil or water. A person who is the reservoir

for a pathogen may be ill or may be an asymptomatic carrier who, although having no symptoms, can spread infection.

3. **Portal of exit:** To transmit infection, the pathogen must leave the reservoir through some portal of exit. In the case of a human reservoir, portals of exit include saliva, the mucous membranes, blood, feces, and nose and throat discharges.
4. **Means of transmission:** Transmission can occur directly or indirectly. In *direct transmission*, the pathogen is passed from one person to another without an intermediary. Most common respiratory infections and many intestinal infections are passed directly—for example, when a person with an infectious agent on his or her hands touches someone else. Other means of direct transmission include sexual contact and contact with blood.

In *indirect transmission*, animals or insects such as rats, ticks, and mosquitoes serve as **vectors**, carrying the pathogen from one host to another. Pathogens can also be transmitted via contaminated soil, food, or water or from inanimate objects, such as eating utensils, door-knobs, and handkerchiefs. Some pathogens float in the air for long periods, suspended on tiny particles of dust or droplets that can travel long distances before they are inhaled and cause infection.

5. **Portal of entry:** To infect a new host, a pathogen must have a portal of entry into the body. Pathogens can enter through direct contact with or penetration of the skin or mucous membranes, inhalation, or ingestion.

reservoir A natural environment in which a pathogen typically lives.

vector An insect, rodent, or other organism that carries and transmits a pathogen from one host to another.

TERMS

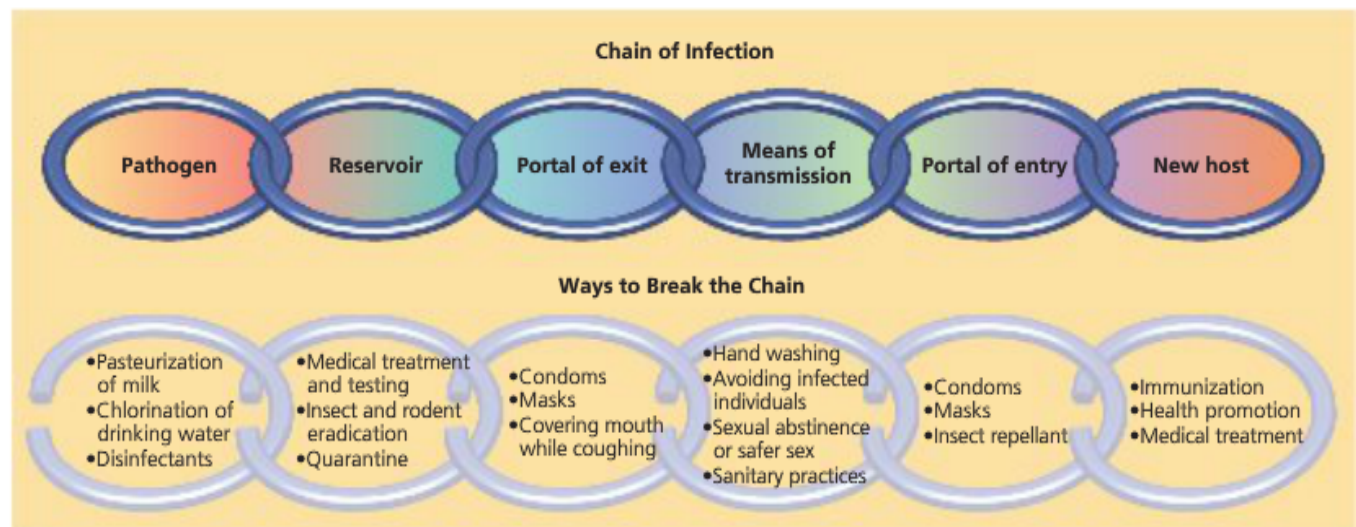


FIGURE 17.4 The chain of infection. Any break in the chain of infection can prevent disease.

Pathogens that enter the skin or mucous membranes can cause a local infection of the tissue, or they may penetrate into the bloodstream or lymphatic system, thereby causing a **systemic infection**. Agents that cause sexually transmitted diseases (STDs) usually enter the body through the mucous membranes lining the urethra (in males) or the cervix (in females). Organisms that are transmitted via respiratory secretions may cause upper respiratory infections or pneumonia, or they may enter the bloodstream and cause systemic infection. Food-borne and waterborne organisms enter the mouth and travel to the tissue that will best support their reproduction. They may attack the cells of the small intestine or the colon, causing diarrhea, or they may enter the bloodstream via the digestive system and travel to other parts of the body.

6. **The new host:** Once in the new host, a variety of factors determine whether the pathogen will be able to establish itself and cause infection. People with a strong immune system or resistance to a particular pathogen are less likely to become ill than people with poor immunity. If conditions are right, the pathogen will multiply and produce disease in the new host. In such a case, the new host may become a reservoir from which a new chain of infection can be started.

Breaking the Chain Interrupting the chain of infection at any point can prevent disease. Strategies for breaking the chain include both public health measures and individual action. For example, a pathogen's reservoir can be isolated or destroyed, as when a sick individual is placed under quarantine or when insects or animals carrying pathogens are killed. Public sanitation practices, such as sewage treatment and the chlorination of drinking water, can also kill pathogens. Transmission can be disrupted through strategies like hand washing and the use of face masks. Immunization and the treatment of infected hosts can stop the pathogen from multiplying, producing a serious disease, and being passed on to a new host. Figure 17.4 lists methods of breaking the chain of infection.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think about the last time you were sick with a cold, the flu, or an intestinal infection. Can you identify the reservoir from which the infection came? What vector, if any, transmitted the illness to you? Did you pass the infection to anyone else? If so, how?

Epidemics and Pandemics

The rapid spread of a disease or health condition is called an **epidemic**. Although the word is usually used with reference to infectious diseases, it is also used for health conditions that are not caused by an infectious organism. For example, it is often said that obesity and diabetes have reached epidemic proportions in the United States.

An important underlying premise of the concept of “epidemic” is that the occurrence of the disease is greater than

what is expected normally. Thus the common cold, which occurs with great frequency, is never classified as an epidemic. Conversely, the term *epidemic* is used to refer to outbreaks of diseases that are not widespread. For example, outbreaks of Ebola virus, which causes highly lethal hemorrhagic fever, are referred to as epidemics even though they have never been widespread.

When an epidemic is widespread, it is called a **pandemic**. A pandemic is an epidemic that has spread across a large area, such as an entire nation, a continent, or even the world. In contrast to the term *epidemic*, the term *pandemic* refers exclusively to infectious disease. Human history has been punctuated by numerous pandemics of various diseases, including bubonic plague, smallpox, and influenza. One of the most severe influenza pandemics occurred in 1918–1919, following World War I, when 20–40% of the world's population became ill and as many as 40 million people died.

Not all widespread infectious diseases are pandemics. An infectious disease that is maintained in a human population or in a particular area in the absence of the introduction of an external infectious agent is said to be *endemic*. Endemic diseases generally occur at low frequency in particular populations or regions. For example, malaria is endemic to low-altitude areas of northern and eastern South Africa. Seasonal epidemics of malaria can occur in these areas where malaria is endemic. In other words, there are seasonal spikes in the number of malaria cases in these endemic areas.

H1N1 Influenza In 2009 an outbreak of influenza caused by a virus never before identified as a cause of human illness sparked fears of a worldwide influenza pandemic. Most people had no immunity to this new strain, initially called swine flu and subsequently labeled H1N1 influenza A virus. The influenza A virus mutates frequently during replication, and it can

In an epidemic, the occurrence of the disease is greater than normally expected. Because the common cold occurs very frequently, it is never classified as an epidemic.

systemic infection An infection spread by the blood or lymphatic system to large portions of the body.

epidemic A rapidly spreading disease or health-related condition.

pandemic A widespread epidemic.

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also exchange genes with other influenza A viruses, including strains that infect domestic and wild animals. The H1N1 strain resulted from a combination of genes from four different viruses: two from swine flu viruses, one from an avian (bird) flu virus, and one from a human flu virus. The addition of the gene from a human virus meant that humans could be infected with it, and, because it was new, they would have no prior immunity.

In June 2009, with cases reported in 74 countries, the World Health Organization declared that a pandemic was under way. By February 2010, the WHO reported up to 86 million cases and up to nearly 18,000 deaths. By May of that year, flu activity had tapered off and declined to normal levels, but the WHO continues to track trends globally, and the CDC continues to recommend H1N1 vaccination for persons aged 6 months to 24 years and people aged 25–64 years who are at high risk.

H5N1 Influenza Since 1998 scientists have been monitoring the progress of another influenza A virus known as H5N1, or avian (bird) influenza. This strain infects chickens, ducks, and geese as well as wild birds; it doesn't pass easily to humans or among humans, but when it does, it is deadly. According to recent WHO reports, more than 600 people worldwide have been infected with H5N1, and 350 of them have died.

Scientists studying the virus have been investigating how many mutations would be needed for H5N1 to pass easily among humans. In 2011 reports came that a lab in the Netherlands and another at the University of Wisconsin had succeeded in creating an airborne version of H5N1 with just four mutations. Before the studies could be published, the U.S. National Science Advisory Board on Biosafety requested that sensitive information about how the virus was created be withheld out of fear it could be used in a bioterrorist attack. Some officials expressed the opinion that the research should never have been done at all. On the other hand, some scientists objected to the suppression of research. By March 2012, however, public health officials decided that concerns were overblown, and the advisory board recommended that these studies be published in full.

PATHOGENS AND DISEASE

Worldwide, infectious diseases are responsible for more than 11 million deaths each year (Table 17.3). The pathogens that cause infectious diseases include bacteria, viruses, fungi, protozoa, parasitic worms, and prions (Figure 17.5). Infections can occur almost anywhere in or on the body. Examples of common infections are bronchitis, infection of the airways (bronchi); meningitis, infection of the tissue surrounding the brain and spinal cord; and conjunctivitis, infection of the layer of cells surrounding the eyes.

Bacteria

The most abundant living things on earth are **bacteria**, which are single-celled organisms that usually reproduce by splitting

VITAL STATISTICS

Table 17.3

Annual New Cases of Top Infectious Diseases

DISEASE	NEW CASES
Diarrheal diseases	~2 billion per year
Malaria	216 million in 2010
Pneumonia	~14,500,000 in 2000 (children < 5 years old)
Tuberculosis	5,797,317 in 2010
HIV	2,700,000 in 2010
Mumps	546,684 in 2009
Leprosy	244,617 in 2009
Measles	222,318 in 2009
Rubella	121,378 in 2009
Pertussis	106,207 in 2009

SOURCES: World Health Organization. Fact Sheets (<http://www.who.int/mediacentre/factsheets/fs360/en>); WHO Statistical Information System (WHOSIS), World Health Statistics 2011 (<http://www.who.int/whosis/whostat/2011/en/index.html>).

in two to create a pair of identical cells. Bacteria are often classified by their shape: bacilli (rod-shaped), cocci (spherical), spirochete (spiral-shaped), or vibrios (comma-shaped).

Many species of bacteria are beneficial, but some are pathogenic, causing disease in their hosts. About 100 species of bacteria can cause disease in humans. We harbor both helpful and harmful bacteria on our skin and in our gastrointestinal and reproductive tracts. The human colon contains helpful bacteria that produce certain vitamins and help digest nutrients. Helpful bacteria also keep harmful bacteria in check by competing for food and resources and secreting substances toxic to pathogenic bacteria. For example, *Lactobacillus acidophilus* resides in the vagina and produces chemicals that kill yeast and bacteria that cause vaginal infections.

Pathogenic bacteria cause disease when they get into the body and crowd out helpful bacteria or grow in tissues that are normally sterile, such as the bladder. They can enter the body through a cut in the skin, an insect bite, contaminated food or drink, sexual activity, or any of several other means. They usually cause illness by invading body cells or by producing toxins.

Pneumonia Inflammation of the lungs, called **pneumonia**, may be caused by infection with bacteria, viruses, or fungi or by contact with chemical toxins or irritants. Pneumonia can be serious if the alveoli (air sacs) become clogged with fluid, thus preventing oxygen from reaching the bloodstream. Pneumonia

bacterium (plural, bacteria) A microscopic single-celled organism that may be helpful or harmful to humans.

pneumonia Inflammation of the lungs, typically caused by infection or exposure to chemical toxins or irritants.

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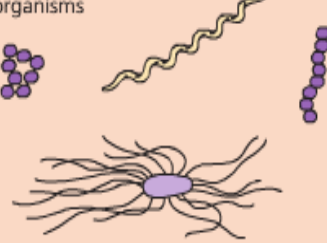
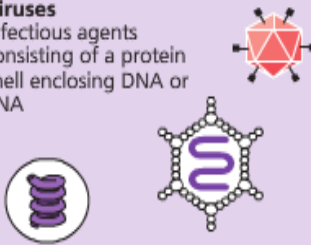
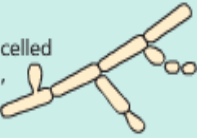
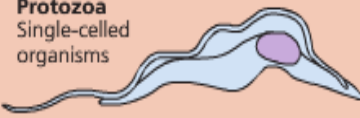
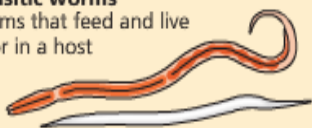
Type of Organism	Selected Pathogens	Associated Diseases
Bacteria Microscopic single-celled organisms 	<i>Bordetella pertussis</i> <i>Borrelia burgdorferi</i> <i>Chlamydia</i> <i>Clostridium tetani</i> <i>Helicobacter pylori</i> <i>Legionella pneumophila</i> <i>Mycobacterium tuberculosis</i> <i>Mycoplasma</i> <i>Neisseria</i> <i>Rickettsia</i> <i>Staphylococcus</i> <i>Streptococcus</i>	Pertussis (whooping cough) Lyme disease Pneumonia (<i>C. pneumoniae</i>), chlamydia (<i>C. trachomatis</i>) Tetanus Peptic ulcers Legionnaire's disease Tuberculosis Pneumonia, ear infections, sore throat, urethritis Gonorrhea (<i>N. gonorrhoeae</i>), meningitis (<i>N. meningitidis</i>) Rocky Mountain spotted fever, typhus Boils and other skin infections, toxic shock syndrome Strep throat, skin infections, pneumonia, rheumatic fever and rheumatic heart disease, necrotizing fascitis
Viruses Infectious agents consisting of a protein shell enclosing DNA or RNA 	Coronavirus, rhinovirus Epstein-Barr virus Hepatitis viruses Herpes simplex 1 and 2 Human immunodeficiency virus Human papillomaviruses Influenza viruses A and B Paramyxovirus Rhabdovirus Togavirus Varicella-zoster	Severe acute respiratory syndrome (SARS), common cold Infectious mononucleosis Hepatitis (inflammation of the liver) Cold sores, genital herpes HIV/AIDS Warts, cervical cancer Flu Measles, mumps Rabies Rubella Chicken pox, shingles
Fungi Single- or multicelled organisms (e.g., yeasts, molds) 	<i>Candida albicans</i> <i>Cryptococcus neoformans</i> Dermatophyte fungi <i>Histoplasma capsulatum</i> <i>Coccidioides immitis</i>	Yeast infections, thrush Pneumonia, meningitis Athlete's foot, jock itch, ringworm, nail infections Histoplasmosis Coccidioidomycosis
Protozoa Single-celled organisms 	<i>Entamoeba histolytica</i> <i>Giardia lamblia</i> <i>Plasmodia</i> <i>Trichomonas vaginalis</i> <i>Trypanosoma brucei</i>	Amoebic dysentery Giardiasis Malaria Trichomoniasis African sleeping sickness
Parasitic worms Worms that feed and live on or in a host 	<i>Ancylostoma duodenale</i> <i>Ascaris lumbricoides</i> Beef, pork, or fish tapeworms <i>Enterobius vermicularis</i> <i>Necator americanus</i> <i>Schistosoma</i>	Ancylostomiasis (hookworm infection) Ascariasis (roundworm infection) Tapeworm infection Pinworm infection Hookworm infection Cercarial dermatitis (swimmer's itch), schistosomiasis
Prions Proteinaceous infectious particles	PrP ^{Sc}	Creutzfeldt-Jakob disease (CJD)

FIGURE 17.5 Pathogens and associated infectious diseases.

often follows another illness, such as a cold or the flu, but the symptoms are typically more severe—fever, chills, shortness of breath, increased mucus production, and cough. Pneumonia is one of the 10 leading causes of death for Americans; people most at risk for severe infection include those under age 2 and over age 75 and those with chronic health problems such as heart disease, asthma, or HIV. Worldwide, pneumonia is the leading cause of death for children under 5 years of age.

The most common cause of bacterial pneumonia is *Streptococcus pneumoniae*, or pneumococcus. A vaccine is available for pneumococcal pneumonia and is recommended for all adults aged 65 and older and others at risk. Other bacteria that may

cause pneumonia include *Haemophilus influenzae*, *Chlamydia pneumoniae*, and *Mycoplasma pneumoniae*. *Mycoplasma* is a very small bacterium; *M. pneumoniae* causes a mild form of pneumonia often called “walking pneumonia.” Outbreaks of infection with mycoplasmas are relatively common among young adults, especially in crowded settings such as dormitories. Bacterial pneumonia can be treated with antibiotics.

Meningitis Inflammation of the *meninges*, the protective membranes covering the brain and spinal cord, is called **meningitis**. Inflammation is usually caused by infection of the fluid surrounding the brain. The infection can be caused by a

the skin and in the nasal passages of healthy people. Occasionally staphylococci enter the body and cause an infection, ranging from minor skin infections such as boils to very serious conditions such as blood infections and pneumonia.

Staphylococcus aureus is responsible for many cases of toxic shock syndrome (TSS). The bacteria produce a toxin that causes a massive proliferation of T cells that can bind to it. The staphylococcus toxins are referred to as “super antigens” because the massive proliferation of T cells results in excessive production of pro-inflammatory cytokines. This “cytokine storm” causes tissue damage, widespread coagulation of blood in the blood vessels, and ultimately organ failure. TSS was first diagnosed in women using highly absorbent tampons, which appear to allow the growth of staphylococci; however, about half of all cases occur in men and in women not using tampons. (See Chapter 6 for information about toxic shock syndrome as it relates to contraception.)

A very serious antibiotic-resistant infection is caused by a staphylococcus bacterium known as methicillin-resistant *Staphylococcus aureus* (MRSA). Many cases of MRSA infection occur in hospitalized patients, and these infections tend to be severe. They include infections of surgical wounds, pneumonia, urinary tract infections, and blood infections. MRSA is also common in the community (outside hospital settings), where it usually infects the skin, causing painful lesions that resemble infected spider bites. The spread of MRSA infection is associated with places where people are in close contact with one another, such as locker rooms and playing fields; athletes are particularly at risk and should keep any cuts or abrasions covered. The best defense against MRSA, whether in health care settings or in the community, is good hygiene and frequent hand washing.

Tuberculosis Caused by the bacterium *Mycobacterium tuberculosis*, **tuberculosis (TB)** is a chronic bacterial infection that usually affects the lungs, though it can affect other organs as well. TB is spread via the respiratory route. Symptoms include coughing, fatigue, night sweats, weight loss, and fever.

Between 10 and 15 million Americans have been infected with *M. tuberculosis* and continue to carry it. Only about 10% of people with latent TB infections actually develop an active case of the disease; the immune system usually prevents the disease from becoming active. In the United States, active TB is most common among people infected with HIV, recent immigrants from countries where TB is endemic, and those who live in inner cities. In 2011 a total of 10,521 new cases of TB were reported—an incidence of 3.4 cases per 100,000 population. This is 6.4% lower than the rate in 2010 and the lowest rate since national tracking began in 1953.

Many strains of tuberculosis respond to antibiotics, but only over a course of treatment lasting 6–12 months. Failure to complete treatment can lead to relapse and the development of



Skin infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA) can be very hard to treat.

strains of antibiotic-resistant bacteria. Multidrug-resistant TB (MDR TB) is resistant to at least two of the best anti-TB drugs. Extensively drug-resistant TB (XDR TB) is resistant to those drugs as well as some second-line drugs. XDR TB is relatively rare, but patients with this form of TB have fewer and less effective treatment options. TB is a leading cause of death in people with HIV infection.

Tickborne Infections Some diseases are transmitted via insect vectors. Lyme disease is one such infection, and it accounts for more than 23,000 cases per year. It is spread by the bite of a tick that is infected with the spiral-shaped bacterium *Borrelia burgdorferi*. Ticks acquire the bacterium by ingesting the blood of an infected animal; they can then transmit the microbe to their

next host. The deer tick is responsible for transmitting Lyme disease bacteria to humans in the northeastern and north-central United States; on the Pacific Coast, the culprit is the western black-legged tick. Lyme disease has been reported in 48 states, but significant risk of infection is found in only about 100 counties in 10 states located in the northeastern and mid-Atlantic seaboard, the upper north-central region, and parts of northern California.

Symptoms of Lyme disease vary but typically occur in three stages. In the first stage, about 80% of victims develop a bull's-eye-shaped red rash expanding from the area of the bite, usually about two weeks after the bite occurs. The second stage occurs weeks to months later in 10–20% of untreated patients; symptoms may involve the nervous and cardiovascular systems and can include impaired coordination,

QUICK STATS

**One-third
of the world's
population is
infected with
tuberculosis.**

—CDC, 2012

tuberculosis (TB) A chronic bacterial infection that usually affects the lungs.

TERMS

partial facial paralysis, and heart rhythm abnormalities. These symptoms usually disappear on their own within a few weeks. The third stage, which occurs in about half of untreated people, can develop months or years after the tick bite and usually consists of chronic or recurring arthritis. Lyme disease can also cause fetal damage or death at any stage of pregnancy. Lyme disease is treatable at all stages, although arthritis symptoms may not completely resolve. Lyme disease is preventable by avoiding contact with ticks or by removing a tick before it has had the chance to transmit the infection.

Rocky Mountain spotted fever and typhus are caused by the *rickettsias* bacterium and are also transmitted via tick bites. Rocky Mountain spotted fever is characterized by sudden onset of fever, headache, and muscle pain, followed by development of a spotted rash. Ehrlichiosis, another tickborne disease, typically causes less severe symptoms.

Ulcers About 25 million Americans suffer from *ulcers*, which are sores in the lining of the stomach or the first section of the small intestine (duodenum). Long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs) can contribute to the development of ulcers. However, up to 90% of ulcers are caused by infection with the bacterium *Helicobacter pylori*. If tests show the presence of *H. pylori*, antibiotics often cure the infection and the ulcers. Persons who take NSAIDs and contract ulcers should be tested for *Helicobacter pylori* because it is likely that they are infected and withdrawing of NSAIDs alone will not cure them.

Other Bacterial Infections The following are a few of the many other infections caused by bacteria:

- **Tetanus:** Also known as lockjaw, tetanus is caused by the bacterium *Clostridium tetani*, which thrives in deep puncture wounds and produces a deadly toxin. The toxin causes muscular stiffness and spasms, and infection is fatal in about 30% of cases. Due to widespread vaccination, tetanus is rare in the United States. Worldwide, however, more than 200,000 people die from tetanus each year, primarily newborns infected through unsterile cutting of the umbilical cord.
- **C. diff:** Another type of *Clostridium* bacteria, called *Clostridium difficile* (*C. diff*), has joined MRSA as a major emerging threat in American health care settings, particularly hospitals. Considered a health care–associated infection, *C. diff* occurs in patients with conditions requiring prolonged use of antibiotics. It causes inflammation of the colon, resulting in diarrhea, fever, and nausea. Bacterial spores can live outside the body for long periods and can be found on objects like medical equipment, bathroom fixtures, and bed linens, as well as on people's hands. Most cases of *C. diff* infection respond to antibiotics, but about 14,000 people die each year from this infection. The CDC recommends that doctors, nurses, and other health care providers wash their hands frequently to reduce the spread of the bacterium.

- **Pertussis:** Also known as whooping cough, pertussis is a highly contagious respiratory illness caused by the bacterium *Bordetella pertussis*. Pertussis is characterized by bursts of rapid coughing, followed by a long attempt at inhalation that is often accompanied by a high-pitched whoop; symptoms may persist for 2–8 weeks. The number of pertussis cases in the United States has risen steadily over the past two decades to more than 11,000 cases per year. Those at high risk include infants and children who are too young to be fully vaccinated and those who have not completed the primary vaccination series. Adolescents and adults become susceptible when immunity from vaccination wanes, so a booster shot is recommended at 11–12 years or during adolescence and thereafter every 10 years. Adults account for about 28% of whooping cough cases.

- **Urinary tract infections (UTIs):** Infection of the bladder and urethra is most common among sexually active women, but UTIs can occur in anyone. The bacterium *Escherichia coli* is the most common infectious agent, responsible for about 80% of all UTIs. Infection most often occurs when bacteria from the digestive tract that live on the skin around the anus get pushed toward the opening of the urethra during sexual intercourse; the bacteria then travel up the urethra and into the bladder. Urinating before and after intercourse may help prevent UTIs.

Other illnesses caused by bacteria include foodborne illness, discussed in Chapter 12, and sexually transmitted diseases, discussed in Chapter 18.

Antibiotic Treatments The body's immune system can fight off many, if not most, bacterial infections. However, while the body musters its defenses, some bacteria can cause a great deal of damage. In particular, inflammation, caused by the gathering of white blood cells, may lead to scarring and permanently damaged tissues. Antibiotics can help the body deal with these infections.

ACTIONS OF ANTIBIOTICS Antibiotics are both naturally occurring and synthetic substances that can kill bacteria. Most antibiotics work in a similar fashion: they interfere with the reproduction of bacteria. Penicillins inhibit the formation of the cell walls when bacteria divide to form new cells. Other antibiotics inhibit the production of certain proteins by the bacteria, and still others interfere directly with the reading of genetic material (DNA) during the reproductive process. Antibiotics are among the most widely prescribed and most effective drugs.

ANTIBIOTIC RESISTANCE Overuse of antibiotics has led to an increase in bacterial resistance to their effects. A bacterium can become resistant from a chance genetic mutation or through the transfer of genetic material from one bacterium to another. When exposed to antibiotics, resistant bacteria can grow and flourish while the antibiotic-sensitive bacteria die off. Eventually an entire colony of bacteria can develop resistance

antibiotics Synthetic or naturally occurring substances used as drugs to kill bacteria.

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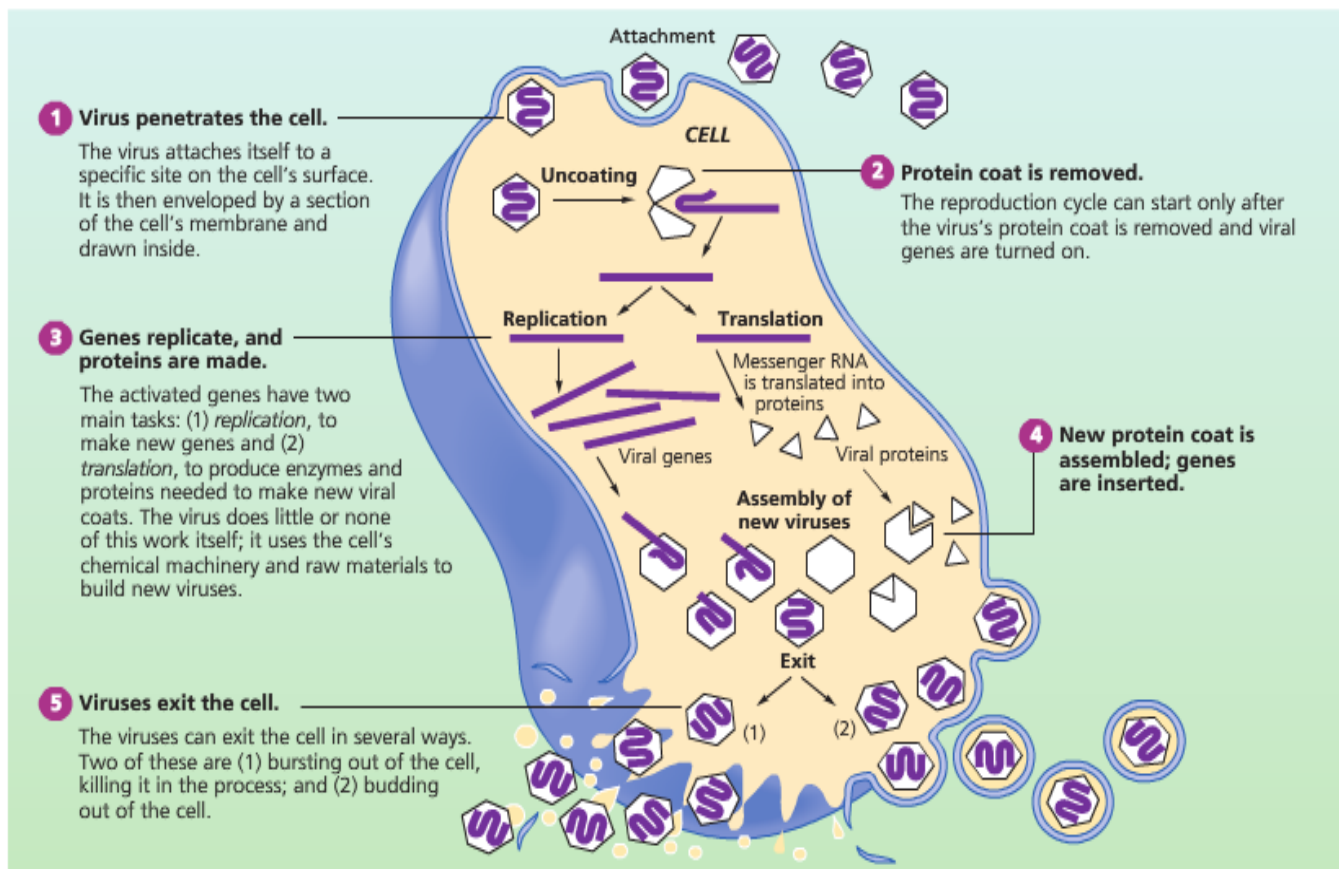


FIGURE 17.6 Life cycle of a virus.

to one or more antibiotics and become very difficult to treat. Antibiotic-resistant strains of many common bacteria have developed, including strains of gonorrhea, salmonella, and tuberculosis. Antibiotic resistance is a major factor contributing to the rise in problematic infectious diseases.

The more often bacteria encounter antibiotics, the more likely they are to develop resistance. Resistance is promoted when people fail to take the full course of an antibiotic or when they inappropriately take antibiotics for viral infections. Another possible source of resistance is the use of antibiotics in agriculture, which is estimated to account for 50–80% of the 25,000 tons of antibiotics used annually in the United States. At least four species of antibiotic-resistant bacteria have been transmitted from food animals to humans, leading the FDA to issue guidelines to the pharmaceutical industry regarding the use of new antibiotics in food-producing animals. Recent studies show that antibiotics cause long-term changes to the protective bacteria in our bodies and may cause an increased susceptibility to infections and disease.

You can help prevent the development of antibiotic-resistant strains of bacteria by using antibiotics properly:

- Don't ask your doctor for an antibiotic every time you get sick. Antibiotics are helpful for bacterial infections but are ineffective against viruses.

- Use antibiotics as directed, and finish the full course of medication even if you begin to feel better. This helps ensure that all targeted bacteria are killed off.

- Never take an antibiotic without a prescription. If you take an antibiotic for a viral infection, take the wrong one, or take an insufficient dose, your illness will not improve.

Antibiotics are not effective against viral illnesses. Talk to your doctor before taking antibiotics.

Viruses

A **virus** is a microscopic organism consisting of genetic material covered by a protein coat. Visible only with an electron (high-magnification) microscope, viruses are about one one-hundredth of the size of a typical bacterium. Viruses lack the enzymes essential to energy production and protein synthesis in normal animal cells, and they can replicate only inside the cells of another organism. Once a virus is inside the host cell, it sheds its protein covering and exploits the host's cellular machinery to produce more viruses like itself (Figure 17.6).

virus A very small infectious agent composed of nucleic acid (DNA or RNA) surrounded by a protein coat; lacks an independent metabolism and reproduces only within a host cell.

TERMS

CRITICAL CONSUMER

Preventing and Treating the Common Cold



Prevention

Colds are usually spread by hand-to-hand contact with another person or with objects such as doorknobs and telephones that an infected person has handled. The best way to avoid transmission is to wash your hands frequently with warm water and soap. Keeping your immune system strong is another good prevention strategy (see the guidelines provided later in the chapter).

Home Treatments

- Get extra rest. It isn't usually necessary to stay home in bed, but you will need to slow down a little from your usual routine to give your body a chance to fight the infection.
- Drink plenty of liquids to prevent dehydration. Hot liquids such as herbal tea and clear chicken soup will soothe a sore throat and loosen secretions; gargling with slightly salty water may also help. Avoid alcoholic beverages when you have a cold.
- Use a humidifier to help eliminate nasal stuffiness and soothe inflamed membranes.
- Use a personal steam inhaler for 20 minutes when you suspect that you have been in contact with someone who has a cold. This treatment can abort a cold in its early stages but is not so effective if the infection is beyond the sore throat stage.

Over-the-Counter Treatments

Avoid multisymptom cold remedies. Because these products include drugs to treat symptoms you may not have, you risk experiencing side effects from medications you don't need. It's better to treat each symptom separately:

- **Analgesics**—aspirin, acetaminophen (Tylenol), ibuprofen (Advil or Motrin), and naproxen sodium (Aleve)—all help lower fever and relieve muscle aches. Use of aspirin is associated with an increased risk of a serious condition called Reye's syndrome in children and teenagers; for this reason, aspirin should be given only to adults.
- **Decongestants** shrink nasal blood vessels, relieving swelling and congestion. However, they may dry out mucous membranes in the



throat and make a sore throat worse. Nasal sprays shouldn't be used for more than two or three days to avoid rebound congestion.

- **Cough medicines** may be helpful when your cough is nonproductive (not bringing up mucus) or if it disrupts your sleep or work. Expectorants make coughs more productive by increasing the volume of mucus and decreasing its thickness, thereby helping remove irritants from the respiratory airways. Cough suppressants (antitussives) reduce the frequency of coughing.
- **Antihistamines** decrease nasal secretions caused by the effects of histamine, so they are much more useful in treating allergies than in treating colds. Many antihistamines can make you drowsy.

The jury is still out on whether other remedies, including zinc gluconate lozenges, echinacea, and vitamin C, relieve symptoms or shorten the duration of a cold. Researchers are also studying antiviral drugs that target the most common types of cold viruses.

Sometimes a cold leads to a more serious complication, such as bronchitis, pneumonia, or strep throat. If a fever of 102°F or higher persists, or if cold symptoms don't abate after two weeks, see your physician.

connect
ACTIVITY
DO IT ONLINE

The immune system of the host responds by producing substances called *interferons*—the first line of defense against viral infection. Interferons block the spread of virus infection to other cells in the body and can kill infected cells.

Most contagious diseases are caused by viruses. Different viruses infect different kinds of cells, and the seriousness of the disease they cause depends greatly on which kind of cell is infected. The viruses that cause colds, for example, attack upper respiratory tract cells, which are constantly replaced; the disease is therefore mild in otherwise healthy individuals. HIV infection, a viral illness that attacks the cells of the immune system, can destroy the body's ability to fight infectious diseases and is thus extremely serious (see Chapter 18).

The Common Cold Although generally brief, lasting only 1–2 weeks, colds are nonetheless irritating and often interfere with one's normal activities. A cold may be caused by any of more than 200 different viruses that attack the lining of the nasal passages; rhinoviruses and coronaviruses cause a large percentage of all colds among adults.

Cold viruses are almost always transmitted by hand-to-hand contact. To lessen your risk of contracting a cold, wash your hands frequently; if you touch someone else, avoid touching your face until after you've washed your hands.

If you catch a cold, over-the-counter cold remedies may relieve your symptoms, but they do not eliminate the virus (see the box "Preventing and Treating the Common Cold"). Sometimes it is difficult to determine whether your symptoms are

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Table 17.4 What's Causing My Symptoms?

SYMPTOMS	INFLUENZA	COMMON COLD	ALLERGY	SINUSITIS
Headache	Usually	Occasionally	Occasionally	Usually
Muscle aches	Usually (severe)	Usually (mild)	Rarely	Rarely
Fatigue, weakness	Usually (severe; sudden onset; may last several weeks)	Usually (mild)	Rarely	Rarely
Fever	Usually (high, typically 102–104°F; sudden onset; lasts 3–4 days)	Occasionally (mild)	Never	Occasionally
Cough	Usually (often severe)	Occasionally	Occasionally	Usually
Runny, stuffy nose	Occasionally	Usually	Usually	Usually (stuffy)
Nasal discharge	Occasionally	Usually (thick, clear to yellowish green)	Usually (watery, clear)	Usually (thick, yellowish green)
Sneezing	Occasionally	Occasionally	Usually	Rarely
Sore throat	Occasionally	Usually	Occasionally	Rarely
Itchy eyes, nose, throat	Rarely	Rarely	Usually	Never

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due to a virus (as in colds, flu, and some sinus infections), a bacterium (as in other sinus infections), or an allergy, but this information is important for appropriate treatment (Table 17.4). For example, antibiotics will not affect a viral infection but will help treat a bacterial sinus infection.

Influenza Commonly called the flu, **influenza** is an infection of the respiratory tract caused by the influenza virus. (Many people use the term “stomach flu” to describe gastrointestinal illnesses, but these infections are actually caused by organisms other than influenza viruses.) Compared to the common cold, influenza is a more serious illness, usually including a fever and extreme fatigue. Most people who get the flu recover within 1–2 weeks, but some develop potentially life-threatening complications, such as pneumonia. The highest rates of infection occur in children. Influenza is highly contagious and is spread via respiratory droplets.

The most effective way of preventing the flu is through annual vaccination. The seasonal influenza vaccine consists of killed virus and provides protection against the strains of the virus currently circulating; it is updated each year in response to changes in the virus. The CDC recommends vaccination for all people aged 6 months and older. Residents of nursing homes and long-term care facilities, health care workers, and household contacts and caregivers of children up to 5 years old are particularly at risk. In addition to the injected vaccine, a nasal aerosol vaccine is available for healthy children aged 24–59 months and for nonpregnant healthy people aged 5–49 years.

Measles, Mumps, and Rubella Three viral childhood illnesses that have waned in the United States due to effective vaccines are measles, mumps, and rubella (German measles). Measles and rubella are generally characterized by rash and fever. Measles can occasionally cause more severe illness, including liver or brain infection or pneumonia; worldwide, more than 600,000 people die each year from measles. Measles is a highly

contagious disease, and before the introduction of vaccines, more than 90% of Americans contracted measles by age 15.

Rubella, if it infects a pregnant woman, can be transmitted to a fetus, causing miscarriage, stillbirth, and severe birth defects, including deafness, eye and heart defects, and mental impairment.

Mumps generally causes swelling of the parotid (salivary) glands, located just below and in front of the ears. This virus can also cause meningitis and, in males, inflammation of the testes.

Chicken Pox, Cold Sores, and Other Herpesvirus Infections The **herpesviruses** are a large group of viruses. Once infected, the host is never free of the virus. The virus lies latent within certain cells and becomes active periodically, producing symptoms. Herpesviruses are particularly dangerous for people with a depressed immune system, as in the case of HIV infection. The family of herpesviruses includes the following:

- *Varicella-zoster virus*, which causes chicken pox and shingles. Chicken pox is a highly contagious disease characterized by an itchy rash made up of small blisters; the infection is usually mild, although complications are more likely to occur in young infants and adults. After the rash resolves, the virus becomes latent, living in sensory nerves. Many years later, the virus may reactivate and cause shingles. Symptoms of shingles include pain in the affected nerves and a rash on the skin that follows the pattern of the nerve pathways (often a band over

influenza Infection of the respiratory tract by the influenza virus, which is highly infectious and prone to variation; the form changes so rapidly that every year new strains arise; commonly known as the flu.

TERMS

herpesvirus A large family of viruses responsible for cold sores, mononucleosis, chicken pox, shingles, and the STD herpes; causes latent infections.

the ribs on one side of the body). A vaccine is available that prevents chicken pox in the majority of cases and results in milder illness if the disease does occur. It is recommended for children over 12 months of age, unvaccinated adolescents, and adults who have not had chicken pox. A shingles vaccine is recommended for people aged 60 and older regardless of their history of chicken pox or shingles.

- *Herpes simplex virus (HSV) types 1 and 2*, which cause cold sores and the STD herpes (see Chapter 18). Herpes infections are characterized by small, painful ulcers in the area around the mouth or genitals, at the site where a person first contracts the virus. Following the initial infection, HSV becomes latent and may reactivate again and again over time. Many infected people do not know they are infected, and the virus can be transmitted even when sores are not apparent. Antiviral medications are available to prevent recurrences of genital herpes.

- *Epstein-Barr virus (EBV)*, which causes infectious mononucleosis. Mono, as it is commonly called, is characterized by fever, sore throat, swollen lymph nodes, and fatigue. It is usually spread by intimate contact with the saliva of an infected person—hence the nickname “kissing disease.” Mono most often affects adolescents and young adults. EBV can reactivate throughout life with a recurrence of symptoms. In a few people, especially those with HIV infection, EBV is associated with the development of cancers of the lymph system.

Two herpesviruses that can cause severe infections in people with AIDS or who have a suppressed immune system are cytomegalovirus (CMV), which infects the lungs, brain, colon, and eyes, and human herpesvirus 8 (HHV-8), which has been linked to Kaposi’s sarcoma, a cancer of the connective tissue.

Viral Encephalitis HSV type 1 is a possible cause of viral encephalitis—inflammation of brain tissue due to a viral infection. Other possible causes include HIV and several mosquito-borne viruses, including Japanese encephalitis virus, equine encephalomyelitis virus, and West Nile virus. Mild cases of encephalitis may cause fever, headache, nausea, and lethargy; severe cases are characterized by memory loss, delirium, diminished speech function, and seizures, and they may result in permanent brain damage or death.

Viral Hepatitis Viral hepatitis is a term used to describe several different infections that cause inflammation of the liver. Hepatitis is usually caused by one of the three most common hepatitis viruses.

- *Hepatitis A virus (HAV)* causes the mildest form of the disease and is usually transmitted by food or water contaminated by sewage or an infected person.

- *Hepatitis B virus (HBV)* is usually transmitted sexually (see Chapter 18).

- *Hepatitis C virus (HCV)* can also be transmitted sexually, but it is much more commonly passed through direct contact with infected blood via injection drug use or, prior to the development of screening tests, blood transfusions. HBV and, to a lesser extent, HCV can also be passed from a pregnant woman to her child.

There are effective vaccines for hepatitis A and B, but more than 150,000 new cases of hepatitis occur in the United States each year.

Symptoms of acute hepatitis infection can include fatigue, jaundice, abdominal pain, loss of appetite, nausea, and diarrhea. Most people recover from hepatitis A within a month or so. However, 5–10% of people infected with HBV and 85–90% of people infected with HCV become chronic carriers of the virus, capable of infecting others for the rest of their lives. Some chronic carriers remain asymptomatic, while others slowly develop chronic liver disease, cirrhosis, or liver cancer. An estimated 4 million Americans and 500 million people worldwide may be chronic carriers of hepatitis. Each

year in the United States, HBV and HCV are responsible for more than 15,000 deaths.

The extent of HCV infection has only recently been recognized, and most infected people are unaware of their condition. To ensure proper treatment and prevention, testing for HCV may be recommended for people at risk, including people who have ever injected drugs (even once), who received a blood transfusion or a donated organ prior to July 1992, who have engaged in high-risk sexual behavior, or who have had body piercing, tattoos, or acupuncture involving unsterile equipment (see the box “Tattoos and Body Piercing”). Antiviral drugs are available to treat chronic hepatitis, but they are not completely effective and may have significant side effects.

Poliomyelitis An infectious viral disease that affects the nervous system, **poliomyelitis** (polio) can cause irreversible paralysis and death in some affected individuals. As with other vaccine-preventable diseases, the incidence of polio declined dramatically in the United States following the introduction of the vaccine. North and South America are now

Many people infected with hepatitis are not aware that they are infected and may pass the virus to others.

encephalitis Inflammation of the brain; fever, headache, nausea, and lethargy are common initial symptoms, followed in some cases by memory loss, seizures, brain damage, and death.

hepatitis Inflammation of the liver, which can be caused by infection, drugs, or toxins.

jaundice Increased bile pigment levels in the blood, characterized by yellowing of the skin and the whites of the eyes.

poliomyelitis A disease of the nervous system, sometimes crippling; vaccines now prevent most cases of polio.

TERMS



CRITICAL CONSUMER

Tattoos and Body Piercing

Because tattooing and body piercing involve the use of needles, they carry health risks. Tattoos are permanent marks applied with an electrically powered instrument that injects dye into the second layer of the skin. A tattoo typically takes a week or two to heal and should be protected from sun exposure until then. In piercing, the artist pushes a needle through the skin; a piece of jewelry holds the piercing open. Healing time varies depending on the site of the piercing and other factors.

Potential Health Issues

- **Infection:** There is a risk of transmission of bloodborne infectious agents, such as hepatitis, if instruments are not sterilized properly. In 2006 the CDC reported an outbreak of methicillin-resistant *Staphylococcus aureus* among customers of tattoo parlors in several states. Due to the potential risks of infection, people currently cannot donate blood for 12 months following application of body art, including tattoos and some body piercings. People with heart valve problems should check with a physician prior to body piercing to determine if they should take antibiotics before the procedure.
- **Allergic reactions:** Some people may be allergic to pigments used in tattooing or to metals used in body-piercing jewelry. All jewelry should be



made of noncorrosive materials such as stainless steel or titanium; avoid jewelry that contains nickel.

- **Nodules and scars:** Some people may develop granulomas (nodules) or keloids (a type of scar) following tattooing or body piercing.

Choosing a Body Artist and Studio

A body art studio should be clean and have an autoclave for sterilizing instruments. Needles should be sterilized and disposable; piercing guns should not be used because they cannot be adequately sterilized. The body artist should wear disposable latex gloves throughout the procedure. Ask if the studio and/or artist are members of the Alliance of Professional Tattooists (<http://www.safe-tattoos.com>) or the Association of Professional Piercers (<http://www.safepiercing.org>); these organizations have developed infection control and other guidelines for their members to follow.

The National Institute for Occupational Safety and Health issues guidelines designed to protect both tattoo artists and customers from bloodborne infections. They cover such practices as washing hands, changing gloves, disinfecting surfaces, cleaning and sterilizing tools and equipment, and receiving training. Regulations and recommended practices vary from state to state; for more information, contact your state's public health department.

considered free of the disease. It has also been eradicated from most countries of the world and remains endemic only in Afghanistan, Nigeria, and Pakistan.

Rabies Caused by a rhabdovirus, rabies is a potentially fatal infection of the central nervous system that is most often transmitted through an animal bite. U.S. rabies-related deaths among humans declined dramatically during the 20th century due to the widespread vaccination of domestic animals and the development of a highly effective vaccine regimen that provides immunity following exposure (post-exposure prophylaxis, or PEP). PEP consists of one dose of immunoglobulin and five doses of rabies vaccine over a 28-day period.

Human Papillomavirus (HPV) The more than 100 different types of HPV cause a variety of warts (noncancerous

QUICK STATS

Polio remains endemic in only three countries: Afghanistan, Nigeria, and Pakistan.

—World Health Organization, 2012

skin tumors), including common warts on the hands, plantar warts on the soles of the feet, and genital warts around the genitalia. Depending on their location, warts may be removed using over-the-counter preparations or professional methods such as laser surgery or cryosurgery. Because HPV infection is chronic, warts can reappear despite treatment. As described in Chapter 16, HPV causes the majority of cases of cervical cancer. Two HPV vaccines are available and recommended for girls age 9–12, but may also be taken up to age 26. Experts now advise that boys receive HPV vaccine to protect

them against genital warts and prevent certain cancers later in life. HPV is discussed in detail in Chapters 16 and 18. A recent end-of-study analysis of a four-year clinical trial showed that an HPV vaccine is 100% effective in preventing the abnormal proliferation of cervical cells that precedes the development of cervical cancer.

Treating Viral Illnesses Antiviral drugs typically work by interfering with some part of the viral life cycle; for example, they may prevent a virus from entering body cells or from successfully reproducing within cells. Antivirals are currently available to fight infections caused by HIV, influenza, herpes simplex, varicella-zoster, HBV, and HVC. Most other viral diseases must simply run their course.

Fungi

A **fungus** is an organism that reproduces by spores and feeds on organic matter. Fungi include microorganisms as well as multicellular organisms, such as molds and mushrooms. Only about 50 of the many thousands of species of fungi cause disease in humans, and these diseases are usually restricted to the skin, mucous membranes, and lungs. Some fungal diseases are extremely difficult to treat because spores are an especially resistant dormant stage of the organism.

Candida albicans is a common fungus found naturally in the vagina of most women. When excessive growth occurs, the result is itching and discomfort, commonly known as a yeast infection. Factors that increase the growth of *C. albicans* include the use of antibiotics, clothing that keeps the vaginal area excessively warm and moist, pregnancy, oral contraceptive use, and certain diseases, including diabetes and HIV infection. The most common symptom is usually a thick white or yellowish discharge. Prescription and OTC treatments are available. Women should not self-treat unless they are certain from a past medical diagnosis that they have a yeast infection. (Misdiagnosis could mean that a different and more severe infection goes untreated.) *C. albicans* overgrowth can occur in other areas of the body, especially in the mouths of infants (a condition known as thrush).

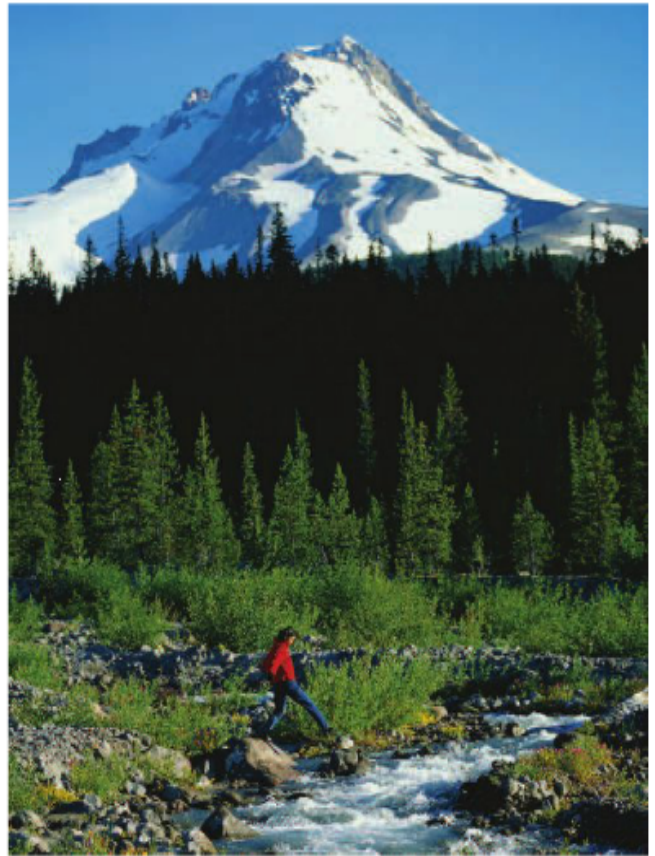
Other common fungal conditions, including athlete's foot, jock itch, and ringworm, affect the skin. These three conditions are usually mild and easy to cure.

Fungi can also cause systemic diseases that are severe, life-threatening, and extremely difficult to treat. Histoplasmosis, or valley fever, causes pulmonary and sometimes systemic disease and is most common in the Mississippi and Ohio River Valleys. Coccidioidomycosis is also known as valley fever because it is most frequent in the San Joaquin Valley of California. Fungal infections can be especially deadly in people with impaired immune systems.

Protozoa

Protozoa are single-celled organisms that can cause a range of diseases in humans. Millions of people in developing countries suffer from protozoal infections.

Malaria, caused by a parasitic protozoan of the genus *Plasmodium*, is characterized by recurrent attacks of severe flu-like symptoms (chills, fever, headache, nausea, and vomiting) and may cause anemia. The protozoan is injected into the bloodstream via a mosquito bite. Although now relatively rare in the United States, malaria is a major killer worldwide; each year there are 350–500 million new cases of malaria



Even seemingly pristine mountain streams can be contaminated with the protozoan *Giardia lamblia*, as many unwary hikers and campers have discovered. Symptoms of giardiasis include abdominal pain, bloating, and diarrhea.

globally and more than 1 million deaths, mostly among infants and children. Drugs are available to prevent and treat malaria, but in the poorest, most remote areas, conditions make it difficult to distribute drugs. Drug-resistant strains of malaria have emerged, requiring new medicines.

Giardiasis is caused by *Giardia lamblia*, a single-celled parasite that lives in the intestines of humans and animals. Giardiasis is characterized by nausea, diarrhea, bloating, and abdominal cramps, and it is among the most common waterborne diseases in the United States. People may become infected with *Giardia* if they consume contaminated food or water or pick up the parasite from the contaminated surface of an object such as a bathroom fixture, diaper pail, or toy.

fungus A single-celled or multicelled organism that reproduces by spores and feeds on organic matter; examples include molds, mushrooms, and yeasts. Fungal diseases include yeast infections, athlete's foot, and ringworm.

TERMS

protozoan (plural, protozoa) A microscopic single-celled organism that often produces recurrent, cyclical attacks of disease.

malaria A severe, recurrent, mosquito-borne infection caused by the parasitic protozoan *Plasmodium*.

giardiasis An intestinal disease caused by the parasitic protozoan *Giardia lamblia*.

People at risk include child care workers, children who attend day care, international travelers, and hikers and campers who drink untreated water. Giardiasis is rarely serious and can be treated with prescription medications.

Other protozoal infections include the following:

- *Trichomoniasis*, a common vaginal infection. Although usually mild and treatable, trich may increase the risk of HIV transmission (see Chapter 18).
- *Trypanosomiasis* (African sleeping sickness), which is transmitted through the bite of an infected tsetse fly and causes extreme fatigue, fever, rash, severe headache, central nervous system damage, and death.
- *Amoebic dysentery*, a severe form of amebiasis—infection of the intestines with the parasite *Entamoeba histolytica*. It is characterized by bloody diarrhea, stomach pain, and fever.

Parasitic Worms

The **parasitic worms** are the largest organisms that can enter the body to cause infection. Worms, including intestinal parasites such as the tapeworm and hookworm, cause a variety of relatively mild infections. Pinworm, the most common worm infection in the United States, primarily affects young children. Pinworms are white and about the size of a staple; they live in the rectum of humans and can cause itching and difficulty sleeping. Smaller worms known as flukes infect organs such as the liver and lungs and, in large numbers, can be deadly. Worm infections generally originate from contaminated food or drink and can be prevented by careful attention to hygiene.

Prions

In recent years, several fatal degenerative disorders of the central nervous system have been linked to **prions**, or proteinaceous infectious particles. Unlike all other infectious agents, prions appear to lack DNA or RNA and to consist only of protein; their presence in the body does not trigger an immune response. Prions have an abnormal shape and form deposits in the brain. They may spread by triggering normal proteins to change their structure to the abnormal, damaging form.

Prions are associated with a class of diseases known as *transmissible spongiform encephalopathies* (TSEs), which are characterized by spongelike holes in the brain. Symptoms of TSEs include loss of coordination, weakness, dementia, and death. Known prion diseases include Creutzfeldt-Jakob disease (CJD)

in humans; bovine spongiform encephalopathy (BSE), or mad cow disease, in cattle; and scrapie in sheep. Some prion diseases are inherited or the result of spontaneous genetic mutations, whereas others are the result of eating infected tissue or being exposed to prions during medical procedures such as organ transplants. A variant form of CJD referred to as vCJD occurs in humans who are infected by eating beef from cows with BSE.

Emerging Infectious Diseases

Emerging infectious diseases are infections whose incidence in humans has increased or threatens to increase in the near future. They include both known diseases that have experienced a resurgence, such as tuberculosis and cholera, and diseases that were previously unknown or confined to specific areas, such as the Ebola and West Nile viruses.

Selected Infections of Concern Although the chances of the average American contracting an exotic infection are very low, emerging infections are a concern to public health officials and represent a challenge to all nations in the future.

WEST NILE VIRUS A mini-outbreak of encephalitis in New York in 1999 led to identification of this virus, which had previously been restricted to Africa, the Middle East, and parts of Europe. Between 1999 and 2007 the virus spread across the United States and caused more than 27,605 cases of human illness and 1086 deaths. West Nile virus is carried by birds and then passed to humans when mosquitoes bite first an infected bird and then a person. Most people who are bitten have few or no symptoms, but the virus can cause permanent brain damage or death in some. Vaccines are being developed for West Nile virus, but it is important to protect yourself from mosquito bites.

SEVERE ACUTE RESPIRATORY SYNDROME (SARS) In February 2003 SARS appeared in southern China and quickly spread to more than 15 countries; it is a form of pneumonia that is fatal in 5–15% of cases. SARS is caused by a type of coronavirus found in wildlife that may have crossed the species barrier when certain wildlife species were consumed as delicacies. By 2004 SARS had been responsible for more than 8000 illnesses and 800 deaths, but there have been no new cases reported since 2004.

ROTAVIRUS The leading viral cause of gastroenteritis, an intestinal inflammation that results in vomiting and diarrhea, rotavirus infects almost every child at one time or another. Worldwide, the virus kills about 600,000 children each year, mostly in developing countries. Left untreated, rotavirus-induced diarrhea can become severe and lead to dehydration, which can be fatal. Rotavirus spreads through poor hygiene and sanitation practices.

ESCHERICHIA COLI O157:H7 This potentially deadly strain of *E. coli*, transmitted in contaminated food, can cause bloody diarrhea and kidney damage. In 2012 an outbreak reported in nine states was traced to contaminated romaine lettuce. Other outbreaks have been linked to ground beef, alfalfa sprouts,

parasitic worm A pathogen that causes intestinal and other infections; includes tapeworms, hookworms, pinworms, and flukes.

TERMS

prions Proteinaceous infectious particles; infectious agents thought to be responsible for a class of neurodegenerative diseases known as transmissible spongiform encephalopathies; Creutzfeldt-Jakob disease (CJD) in humans and bovine spongiform encephalopathy (BSE or mad cow disease) are prion diseases.

unpasteurized juice, petting zoos, and contaminated public swimming pools. An estimated 70,000 cases of *E. coli* O157:H7 infection and 61 deaths occur in the United States each year.

HANTAVIRUS Since hantavirus pulmonary syndrome (HPS) was first recognized in 1993, over 300 cases have been reported in the United States. HPS is caused by the rodent-borne Sin Nombre virus (SNV) and is spread primarily through airborne viral particles from rodent urine, droppings, or saliva. It is characterized by a dangerous fluid buildup in the lungs and is fatal in about 45% of cases. In 2012, an outbreak of hantavirus caused the death of at least three campers in Yosemite National Park.

EBOLA Human outbreaks of the often fatal Ebola hemorrhagic fever (EHF) have occurred only in Africa. The Ebola virus is transmitted by contact with infected blood or other body secretions, and many cases of EHF have been linked to unsanitary conditions in medical facilities. Because symptoms appear quickly and 70% of victims die, usually within a few days, the virus tends not to spread widely.

Factors Contributing to Emerging Infections What's behind this rising tide of infectious diseases? Contributing factors are complex and interrelated.

DRUG RESISTANCE New or increasing drug resistance has been found in organisms that cause malaria, tuberculosis, gonorrhea, influenza, AIDS, and pneumococcal and staphylococcal infections. Infections caused by drug-resistant organisms prolong illness, and—if not treated in time with more effective, expensive drugs—they can cause death. Some bacterial strains now appear to be resistant to all available antibiotics.

POVERTY More than 1 billion people live in extreme poverty, and half the world's population has no regular access to essential drugs. Population growth, urbanization, overcrowding, and migration (including the movement of refugees) also spread infectious diseases.

BREAKDOWN OF PUBLIC HEALTH MEASURES A poor public health infrastructure is often associated with poverty and social upheaval, but problems such as contaminated water supplies can occur even in industrial countries. Inadequate vaccination has led to the reemergence of diseases such as diphtheria and pertussis. Natural disasters such as hurricanes also disrupt the public health infrastructure, leaving survivors with contaminated water and food supplies and no shelter from disease-carrying insects.

TRAVEL AND COMMERCE More than 500 million travelers cross national borders each year, and international tourism and trade open the world to infectious agents. SARS was quickly spread throughout the world by infected air travelers. The reintroduction of cholera into the Western Hemisphere is thought to have occurred through the discharge of bilge water from a Chinese freighter into the waters off Peru.

Some bacterial strains now appear to be resistant to all available antibiotics.



Cases of *E. coli* O157:H7 bacterial infection are increasing, due primarily to the mass production and distribution of food. A relatively small contamination incident can cause serious illness for hundreds of people in many states.

MASS FOOD PRODUCTION AND DISTRIBUTION Food now travels long distances to our table, and microbes are transmitted along with it. Mass production of food increases the likelihood that a chance contamination can lead to mass illness.

HUMAN BEHAVIORS Changing patterns of human behavior affect the spread of infectious diseases. For example, the widespread use of injectable drugs rapidly transmits HIV infection and hepatitis. Changes in sexual behavior over the past 40 years have led to a proliferation of old and new STDs. The use of day care facilities for children has led to increases in the incidence of several infections that cause diarrhea.

BIOTERRORISM The deliberate release of deadly infectious agents is an ongoing concern. Potential bioterrorism agents that the CDC categorizes as a highest concern are those that can be easily disseminated or transmitted from person to person and that have a high mortality rate and the potential for a major public health impact. These include anthrax, smallpox, plague, botulism, and viral hemorrhagic fevers such as Ebola.



EMBRACING WELLNESS

Exercise, Diet, Body Weight, and the Immune System

The field of exercise immunology has provided numerous insights into the effects of exercise on immune function. An important finding of this research is that the effects depend on the amount and intensity of exercise. Moderate exercise (30–60 minutes per day) has positive effects on the immune system. For example, studies found that people who engage in moderate exercise for 30 minutes six or seven days per week have fewer upper respiratory tract infections than do sedentary people. Studies in mice show that regular moderate exercise enhances immune responses to vaccines.

In contrast, excessive exercise has negative effects on the immune system. Extreme training in Olympic athletes, for example, is associated with an increased risk of upper respiratory infections. The period of impaired immunity can be as long as 72 hours. The infection risk in this period is amplified if the person is sleep deprived, stressed, or malnourished.

Diet and body fat also affect immune function. In particular, obese individuals have diminished immune responses to infections and defects in their immune systems. Research shows that

a combination of exercise and changes in diet improves immune function in obese individuals, suggesting an interrelationship among exercise, diet, body weight, and immune competence. In one study, obese men who undertook a high-fiber, low-fat diet and daily aerobic exercise experienced a reduction in inflammation (and also lost weight). Studies in obese mice have shown that moderate daily exercise and dietary control improve their ability to recover from bacterial infection.

To maximize the functioning of your immune system, eat a healthy diet rich in omega-3 fatty acids and try to exercise moderately every day for 30 minutes or more. Avoid exercising strenuously for longer than 90 minutes. If you have a cold, try to engage in moderate exercise, but avoid exercise if you have a more serious medical condition, such as an infection accompanied by fever.

SOURCES: Qingde, Z., S. E. Leeman, and A. Salomon. 2011. Signaling mechanisms in the restoration of impaired immune function due to diet-induced obesity. *Proceedings of the National Academy of Science of the United States of America* 108(7): 2867–2872; Valdez-Ramos, R., et al. 2010. Diet, exercise and gut mucosal immunity. *Proceedings of the Nutrition Society* 69(4): 644–650.

Immune Disorders

Considering the complexity of the immune system, it is not surprising that some disorders and diseases occur when the system fails to operate properly.

Autoimmune Diseases As discussed earlier, the immune system can recognize the body's cells and tissues as "self" and foreign organisms as "nonself." When this ability breaks down, the result is an autoimmune disease. In most autoimmune diseases, the immune system targets or destroys specific tissues. For example, in type 1 diabetes, the insulin-producing cells of the pancreas are destroyed. In multiple sclerosis, the protective coating around nerves is targeted and destroyed. In Hashimoto's thyroiditis, the thyroid gland is gradually destroyed. In rheumatoid arthritis, the membranes lining the joints are destroyed. In systemic lupus erythematosus, destructive inflammation affects the joints, blood vessels, heart, lungs, brain, and kidneys.

The causes of autoimmune diseases are not well understood. The rates of many of these diseases are much higher in women than in men. There are about 2 million Americans with lupus, and 80% of them are women. Among the estimated 1% of Americans with rheumatoid arthritis, women outnumber men 3 to 1. The role of estrogen is under investigation as a contributing factor in this discrepancy, as is the somewhat enhanced immunity of women compared to men. The latter factor could be linked to both longer life spans among women and higher rates of autoimmune disease. Researchers have also hypothesized that an as-yet-unidentified virus may stimulate the immune system and trigger autoimmune disease.

The Immune System and Cancer As explained in Chapter 16, cancer cells are cells that have mutated in ways that allow them to multiply uncontrollably. The immune system can often detect cells that have recently become abnormal and destroy them just as it would a foreign cell. In this way, the immune system protects the body not just from foreign invaders but also from its own mutated cells. But when the immune system is challenged, as it may be when people get older, when they have certain immune disorders (like HIV infection), or when the immune system is suppressed by chemotherapy or other drugs, cancer cells may multiply uncontrollably before the immune system is able to respond sufficiently.

In recent years, conventional cancer treatments have been augmented with a treatment known as immunotherapy. The goal of immunotherapy is to stimulate the patient's immune system to attack tumor cells. One immunotherapeutic strategy involves administering tumor-specific antibodies to the patient to stimulate the immune system to recruit macrophages to destroy the tumor cells. Another strategy is to infuse the patient with immune cells, such as dendritic cells or natural killer cells. Cancer-specific vaccines are also under development. A vaccine for prostate cancer was the first FDA-approved cancer vaccine.

SUPPORTING YOUR IMMUNE SYSTEM

The immune system does an amazing job of protecting you from illness, but you can help ensure its optimal functioning

by choosing healthy behaviors. Here are some general guidelines for supporting your immune system:

- Eat a balanced diet and maintain a healthy weight, as discussed in Chapters 12 and 14.
- Get enough sleep. Most people need about eight hours every night. Sleep helps your body replenish itself and supports the production of immune system cells. Lack of sleep can increase your chances of getting sick.
- Exercise, but not when you're sick. Exercise helps you stay healthy, as discussed in Chapter 13. It also staves off stress, which can weaken your immune system. For more information, see the box "Exercise, Diet, Body Weight, and the Immune System."
- Don't smoke. Smoking decreases the levels of some immune cells (see Chapter 11).
- If you drink alcohol, do so only in moderation (see Chapter 10). Excessive drinking can interfere with normal immune system functioning.
- Make sure that you have sufficient vitamin D in your diet. Vitamin D deficiency has been implicated in several allergic and autoimmune disorders. The RDA for vitamin D is 600 IU per day, but some experts recommend up to 2000 (but no more than 4000) IU per day.
- Wash your hands frequently, as advised throughout this chapter. Antibacterial soap has not been proven to reduce the risk of infection any better than regular soap, especially if you wash properly. Use hand sanitizer when soap and water aren't available; make sure the product is at least 60% alcohol.
- Avoid contact with people who are contagious with an infectious disease.
- Make sure you drink water only from clean sources. Unpurified water from lakes and streams can carry pathogens, even if it seems pristine.
- Avoid contact with disease carriers such as rodents, mosquitoes, and ticks. Never touch or feed wild animals or rodents.
- Practice safer sex (as described in Chapter 18).
- Do not use injectable drugs of any kind (see Chapter 9).

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever had any of the illnesses described in the preceding sections? How were you exposed to the disease? Could you have taken any precautions to avoid it?

- Make sure you have received all your recommended vaccinations, and keep them up-to-date. Your physician can tell you exactly what immunizations you need and when you should have them.

connect™

Connect to Your Choices

Have you ever thought about where you get your behaviors and habits related to infectious diseases? Many factors can influence our behaviors and habits, some not as obvious as others. Was your family conscientious about making sure you got all the recommended vaccinations when you were growing up? Do your roommates or teammates have a casual attitude about personal hygiene habits like hand washing or about sharing antibiotics? Does your campus health clinic conduct public health campaigns about flu shots during flu season?

What are the external factors that influence your choices about infectious diseases? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

Your immune system is a remarkable germ-fighting network, but it needs your help to work at its best.

RIGHT NOW YOU CAN:

- Make sure that you have plenty of soap on hand in your bathroom and kitchen. It does not have to be antibacterial soap.
- Launder your dirty hand and bath towels. It's a good practice to hang towels unfolded to let them air dry and to replace them with clean towels after three uses. Make sure everyone you live with has his or her own towels; sharing can spread germs.
- Move your bedtime up 15 minutes, starting tonight.

IN THE FUTURE YOU CAN:

- Stock up on hand sanitizer and tissues. Put them in your backpack, car, locker, and other places where you might need to wash your hands but soap and water aren't available.
- Make an appointment with your physician to make sure your immunizations are up-to-date.
- Create an immunization record; it can be helpful in the future (for example, if you are ever injured and must decide whether you need a tetanus booster).

SUMMARY

- The immune system includes both surface barriers and the cells, tissues, and organs that mount the immune response.
- Physical and chemical barriers to microorganisms include skin, mucous membranes, and the cilia lining the respiratory tract.
- The immune response is carried out by white blood cells that are continuously produced in the bone marrow. Cells of the innate immune system include neutrophils, eosinophils, macrophages, dendritic cells, and natural killer cells. Cells of the adaptive immune system are lymphocytes—in particular, T cells and B cells.
- The immune response has four stages: recognition of the invading pathogen; rapid replication of killer T cells and B cells; attack by killer T cells and macrophages; and suppression of the immune response.
- Immunization is based on the body's ability to remember previously encountered organisms and retain its strength against them.
- Allergic reactions occur when the immune system responds to harmless substances as if they were dangerous pathogens.
- The step-by-step process by which infections are transmitted from one person to another involves a pathogen, its reservoir, a portal of exit, a means of transmission, a portal of entry, and a new host. Infection can be prevented by breaking the chain at any point.
- The spread of disease may result in epidemics or pandemics.
- Bacteria are single-celled organisms; some cause disease in humans. Significant bacterial infections include pneumonia, meningitis, strep throat, toxic shock syndrome, MRSA, tuberculosis, Lyme disease, and ulcers.
- Most antibiotics work by interrupting the production of new bacteria; they do not work against viruses. Bacteria can become resistant to antibiotics.
- Viruses cannot grow or reproduce themselves; different viruses cause the common cold, influenza, measles, mumps, rubella, chicken pox, cold sores, mononucleosis, encephalitis, hepatitis, polio, and warts.
- Other infectious diseases are caused by certain types of fungi, protozoa, parasitic worms, and prions.
- Autoimmune diseases occur when the body identifies its own cells as foreign.
- A healthy immune system can target and destroy mutant cells that may become cancerous.
- The immune system needs little help other than adequate nutrition and rest, a moderate lifestyle, and protection from excessive stress. Vaccinations also help protect against disease.

FOR MORE INFORMATION

BOOKS

- Barry, J. 2005. *The Great Influenza: The Epic Story of the Deadliest Plague in History*. New York: Penguin. A compelling account of the medical, social, and political aspects of the influenza epidemic of 1918–1919.
- Nakazawa, D. J. 2009. *The Autoimmune Epidemic*. New York: Touchstone. The author explores potential links between autoimmune disorders and environmental toxins.
- Reid, E. 2012. *The Thriving Child: Parenting Successfully through Allergies, Asthma, and Other Common Challenges*. New York: Center Street. A mother's description of raising two children with allergies and asthma in New York City and developing a healthy environment for her family.
- Siegel, M. 2006. *Bird Flu: Everything You Need to Know about the Next Pandemic*. New York: Wiley. A practicing physician and teacher examines the potential threat of an avian flu outbreak and explains the measures we can take to protect ourselves.
- Sompayrac, L. M. 2012. *How the Immune System Works*. 4th ed. Malden, MA: Blackwell Science. A highly readable overview of basic concepts of immunity.

ORGANIZATIONS, HOTLINES, AND WEBSITES

- Alliance for the Prudent Use of Antibiotics*. Provides information about the proper use of antibiotics and tips for avoiding infections.
<http://www.tufts.edu/med/apua>
- American Academy of Allergy, Asthma, and Immunology*. Provides information and publications; pollen counts are available from the website.
<http://www.aaaai.org>
- American Autoimmune-Related Diseases Association*. Provides background information, coping tips, and an online knowledge quiz about autoimmune diseases.
<http://www.aarda.org>
- American College of Allergy, Asthma, and Immunology*. Provides information for patients and physicians; website includes an extensive glossary of terms related to allergies and asthma.
<http://www.acaai.org>
- American Society for Microbiology*. Includes a library of images and an introduction to microbes.
<http://www.microbeworld.org>
- CDC National Center for Emerging and Zoonotic Infectious Diseases*. Provides extensive information on a wide variety of infectious diseases.
<http://www.cdc.gov/nceid/>
- CDC: Vaccines*. Information and answers to frequently asked questions about immunizations.
<http://www.cdc.gov/vaccines/>
- National Foundation for Infectious Diseases*. Provides information about a variety of diseases and disease issues.
<http://www.nfid.org>
- National Institute of Allergy and Infectious Diseases*. Includes fact sheets about many topics relating to allergies and infectious diseases, including tuberculosis and STDs.
<http://www.niaid.nih.gov>

World Health Organization: *Infectious Diseases*. Provides fact sheets about many emerging and tropical diseases as well as information about current outbreaks.

http://www.who.int/topics/infectious_diseases/en/

See also the listings in Chapter 12 (food safety), Chapter 18, and Appendix B.

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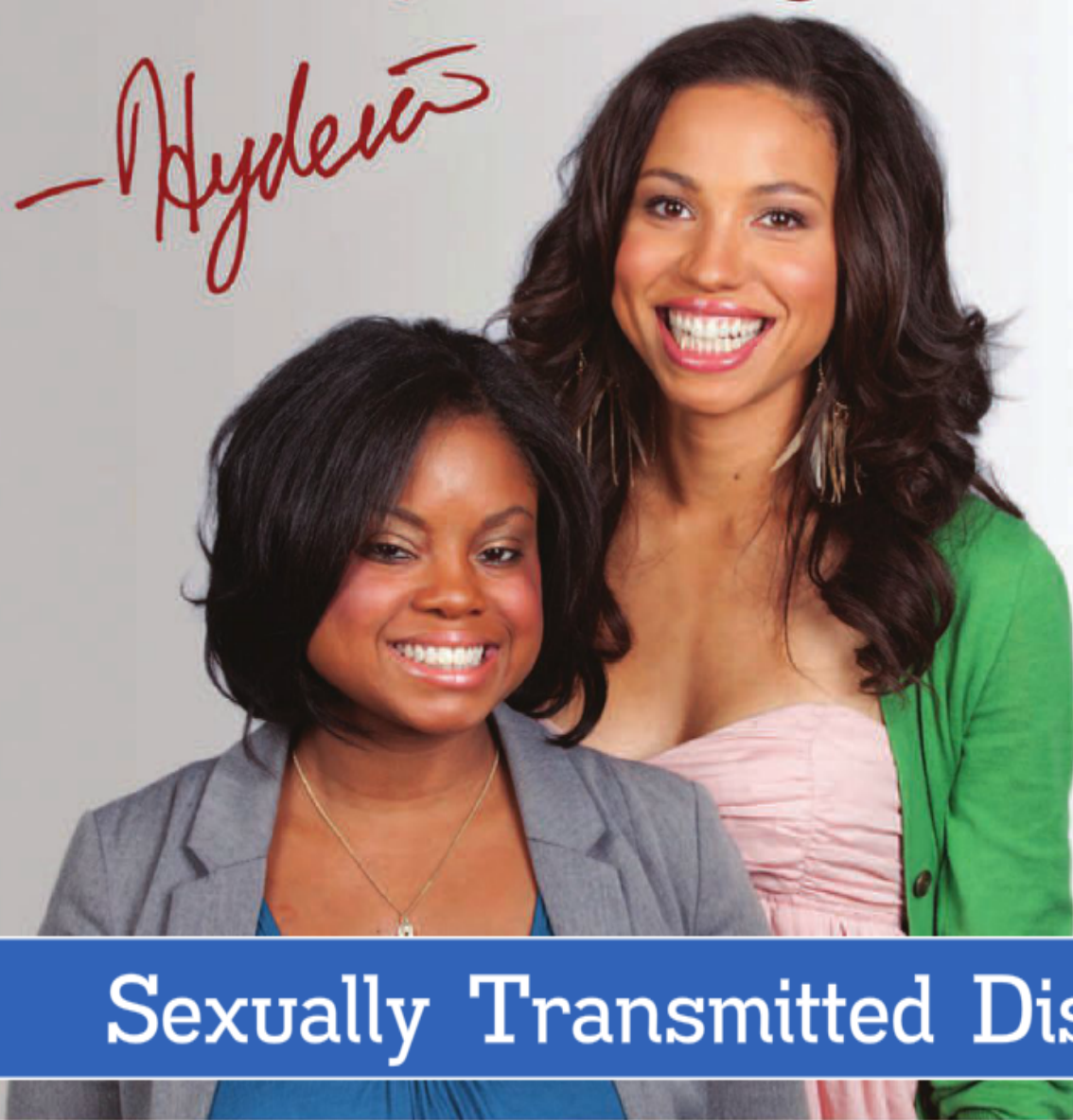
I am a friend, a dreamer, and an activist.
And I am living with HIV.

18

CHAPTER

Let's stop HIV together.

-Hydeia



Sexually Transmitted Diseases

Hydeia (left) has lived with HIV since 1984.

Get the facts. Get tested. Get involved.

www.ActAgainstAIDS.org



LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain how HIV infection affects the body and how it is transmitted, diagnosed, and treated
- Discuss the symptoms, risks, and treatments for the other major STDs
- List strategies for protecting yourself from STDs

TEST YOUR KNOWLEDGE

1. If you have a sexually transmitted disease (STD), you will know it.
True or false?
2. Worldwide, HIV infection is spread primarily via which of the following?
 - a. Injection drug use
 - b. Sex between men
 - c. Mother-to-child transmission
 - d. Heterosexual sex
3. About what percentage of HIV-infected Americans are unaware of their condition?
 - a. 10%
 - b. 20%
 - c. 30%
 - d. 50%
4. A man with an STD is more likely to transmit the infection to a female partner than vice versa.
True or false?
5. After you have had an STD once, you become immune to that disease and cannot get it again.
True or false?

ANSWERS

1. **FALSE.** Many people with STDs have no symptoms and do not know they are infected; however, they can still pass an infection to their partners.
2. **D.** The vast majority of HIV infection cases worldwide result from heterosexual contact, and the majority of new cases occur in teenage girls and young women.
3. **B.** It is estimated that 21% of HIV-infected Americans do not know they are carrying the virus that causes AIDS.
4. **TRUE.** For many STDs, infected men are at least twice as likely as infected women to transmit an STD to their partners.
5. **FALSE.** Reinfection with STDs is very common. For example, if you are treated and cured of chlamydia and then you have sex with your untreated partner, the chances are very good that you will be infected again.

Considering the intimate nature of sexual activity, it is not surprising that many diseases can be transmitted from one person to another through sexual contact. Of course colds, influenza, and many other infections can spread from one sexual partner to another, but sexual contact is not the primary means of transmission for these illnesses. **Sexually transmitted diseases (STDs)**—also called **sexually transmitted infections (STIs)**—spread from person to person mainly through sexual activity. STDs are a particularly insidious group of illnesses because a person can be infected and able to transmit the disease, yet not look or feel sick; this is why the term *sexually transmitted infection (STI)* is coming into common use.

STDs can be prevented. Many STDs can also be cured if treated early and properly. This chapter introduces the major forms of sexually transmitted diseases; it also provides information about safer sexual behavior that helps to protect you from infection and to reduce the spread of these diseases.

THE MAJOR STDs

The following seven STDs pose a major health threat:

- HIV/AIDS
- Chlamydia
- Gonorrhea
- Human papillomavirus (HPV)
- Herpes
- Hepatitis
- Syphilis

These diseases are considered major threats because they are serious in themselves, cause grave complications if left untreated, and pose risks to a fetus or newborn. STDs often result in severe long-term consequences, including chronic pain, infertility, stillbirths, genital cancers, and death.

VITAL STATISTICS

Table 18.1 Annual New Cases of Selected STDs in the United States

STD	NEW CASES
HPV	6,200,000
Trichomoniasis	5,000,000
Chlamydia	1,307,893
Gonorrhea	309,341
Genital herpes	292,000
HIV infection	50,000
Hepatitis B	38,000
Syphilis (all stages)	45,834

SOURCES: Centers for Disease Control and Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. 2011. *Estimates of New HIV Infections in the United States, 2006–2009* (<http://www.cdc.gov/nchhstp/newsroom/docs/HIV-Infections-2006-2009.pdf>); Centers for Disease Control and Prevention. *Sexually Transmitted Disease Surveillance 2010* (<http://www.cdc.gov/std/stats10/default.htm>).

All of these diseases have a relatively high incidence among Americans (Table 18.1). In fact, the United States has the highest rate of STDs of any developed nation; at current rates, half of all young people will acquire an STD by age 25. About 19 million Americans become newly infected with an STD each year.

STIs are caused by more than 30 different organisms, including bacteria, viruses, fungi, protozoa, and parasites (Table 18.2).

HIV Infection and AIDS

The human immunodeficiency virus (HIV) causes acquired immunodeficiency syndrome (AIDS), a disease that without

treatment ultimately kills nearly all of its victims. On average, with the best treatment currently available, someone with HIV infection will live 20 to 30 years or more after diagnosis. For most people infected with HIV worldwide, however, adequate treatment is not available, and most infected people die within 10 years. AIDS originated in Africa sometime during the early 20th century but was not recognized or named until 1981. The disease spread rapidly throughout the world and is now a leading cause of death globally.

An estimated total of 65 million people have been infected since the HIV/AIDS epidemic began—nearly 1% of the world's population—and tens of millions of those people have died (see the box “HIV/AIDS around the World”). Currently about 34 million people are infected with HIV worldwide (Table 18.3), with nearly 70% of them living in sub-Saharan Africa.

For the first time in the history of the AIDS epidemic, the number of people worldwide that are living with HIV infection has begun to level off. Many experts believe that the global HIV epidemic peaked in the late 1990s, at about 3.5 million new infections per year, compared with an estimated 2.7 million new infections in 2010. Despite a slowing of the epidemic, however, AIDS remains a primary cause of death in Africa and continues to be a major cause of mortality around the world.

sexually transmitted disease (STD) or sexually transmitted infection (STI) A disease that is mainly transmitted by sexual contact; some can also be transmitted by other means.

human immunodeficiency virus (HIV) The virus that causes HIV infection and AIDS.

acquired immunodeficiency syndrome (AIDS) A generally fatal, incurable, sexually transmitted viral disease.

Table 18.2 Sexually Transmitted Pathogens and Associated Diseases

BACTERIA	
<i>Chlamydia trachomatis</i>	Chlamydia, pelvic inflammatory disease, epididymitis, urethritis, lymphogranuloma venereum
<i>Gardnerella vaginalis</i>	Bacterial vaginosis
<i>Haemophilus ducreyi</i>	Chancroid
<i>Neisseria gonorrhoeae</i>	Gonorrhea, pelvic inflammatory disease, epididymitis, urethritis
<i>Treponema pallidum</i>	Syphilis
VIRUSES	
Hepatitis B virus (HBV)	Hepatitis, cirrhosis, liver cancer
Herpes simplex viruses (HSV)	Genital herpes, oral–labial herpes (cold sores)
Human immunodeficiency virus (HIV)	HIV infection/AIDS
Human papillomavirus (HPV)	Genital warts; cervical, anal, penile, vulvar, and oral cancers
PROTOZOA	
<i>Trichomonas vaginalis</i>	Trichomoniasis
ECTOPARASITES	
Phthirus pubis	Pubic lice
Sarcoptes scabiei	Scabies



DIVERSITY MATTERS

HIV/AIDS around the World

In 2011 the world marked the 30th year since AIDS was diagnosed in five young gay men in Los Angeles. HIV is now a worldwide scourge, with 65 million people infected and more than 25 million deaths since the epidemic began.

The vast majority of cases—95%—have occurred in developing countries, where heterosexual contact is the primary means of transmission, responsible for 85% of all adult infections. HIV continues to be a disease that disproportionately affects ethnic minorities and the poor. Worldwide, women are the fastest-growing group of newly infected people; half of adults living with HIV in 2010 were women. In sub-Saharan Africa, the region most heavily burdened with HIV, 59% of adults living with HIV were women. About 3.4 million children were living with HIV in 2010, and more than 90% of these children were living in sub-Saharan Africa.

Despite the ongoing tragedy of the HIV epidemic, strides have been made in treatment and prevention measures. In 2003 only 7% of HIV-infected individuals in low- and middle-income countries were receiving antiretroviral treatment; by the end of 2010 that percentage had increased to 47%. In 2010, 67% of pregnant women received treatment to prevent transmission of HIV to their babies, up from just 10% in

2004. Treating HIV with effective drugs not only prolongs life and decreases suffering—it also has a major impact in reducing the spread of the virus because treated individuals are generally much less infectious than untreated people.

The HIV epidemic seems to have stabilized in many parts of the world. Rates of new infections have remained steady or have even dropped in a few regions. Though sub-Saharan Africa remains the hardest-hit area of the world, the number of new infections dropped from 2.2 million in 2001 to 1.8 million in 2009. The expanded availability of antiretroviral medications to this region has contributed significantly to this decline, with a 20% drop in AIDS-related deaths between 2004 and 2009 alone. Still, two-thirds of all HIV-infected people in the world live in sub-Saharan Africa, and nearly three-quarters of all deaths due to AIDS in 2009 occurred there.

Eastern Europe and parts of Asia have also been hit hard by HIV. In many of these areas, HIV infection is seen in intravenous drug users and their sexual partners.

Efforts to combat AIDS are complicated by political, economic, and cultural barriers. Education and prevention programs are often hampered by resistance from social and religious institutions and by the taboo on openly discussing sexual issues. Condoms

are not commonly used in many countries, and women in many societies do not have sufficient control over their lives to demand that men use condoms during sex. Empowering women is a crucial priority in reducing the spread of HIV. In particular, reducing sexual violence against women, promoting financial independence, and increasing women's education and employment opportunities are essential.

Successful prevention approaches include STD treatment and education, public education campaigns about safer sex, and syringe exchange programs for injection drug users. Efforts are ongoing to improve access to barrier protective devices such as condoms. Other measures have included male circumcision, which has been shown to reduce HIV transmission in some studies.

In developed nations such as the United States, new drugs are easing AIDS symptoms and lowering viral levels dramatically for some patients. In the past few years, a growing number of people in poor countries have gained access to antiviral drugs because of the introduction of inexpensive generic drugs and increased international funding for HIV treatment. Still, far too many people with HIV remain untreated, and far too many new infections are occurring.

VITAL STATISTICS

Table 18.3 HIV/AIDS Global Summary: 2010

PEOPLE LIVING WITH HIV

Adults	30,600,000
Adult women	16,800,000
Children (<15 years old)	3,400,000
Total	34,000,000

PEOPLE NEWLY INFECTED WITH HIV

Adults	2,310,000
Children (<15 years old)	390,000
Total	2,700,000

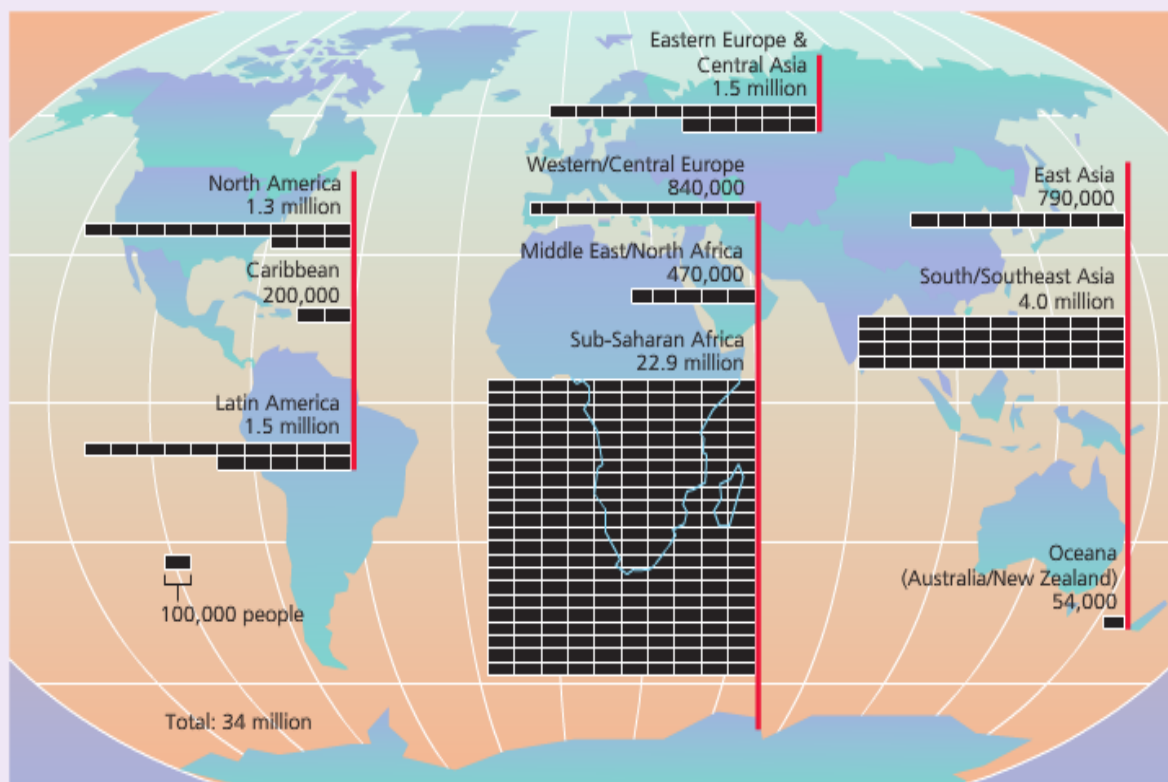
AIDS-RELATED DEATHS

Adults	1,550,000
Children (<15 years old)	250,000
Total	1,800,000

SOURCE: World Health Organization. 2011. *Global HIV/AIDS Response: Epidemic Update and Health Sector Progress towards Universal Access, Progress Report 2011*. Geneva: World Health Organization.

In the United States about 1.2 million people have been infected with HIV. The incidence of HIV has leveled off at about 50,000 new infections annually. More than 619,000 Americans have died from AIDS since the start of the epidemic in 1981. Today about 20% of HIV-infected Americans are unaware of their condition.

What Is HIV Infection? HIV infection is a chronic disease that progressively damages the body's immune system, making an otherwise healthy person less able to resist a variety of infections and disorders. Normally, when a virus or other pathogen enters the body, it is targeted and destroyed by the immune system. But HIV attacks the immune system itself, invading and taking over **CD4 T cells** (a type of helper T cell), macrophages, and other essential elements of the immune system (Chapter 17). HIV enters a human cell and converts its own genetic material, RNA, into DNA. It then inserts this DNA into the chromosomes of the host cell. The viral DNA takes over the CD4 cell, causing it to produce new copies of HIV; it also makes the CD4 cell incapable of performing its immune functions.



Approximate number of people living with HIV/AIDS in 2010.

SOURCES: Joint United Nations Programme on HIV/AIDS. 2011. *UNAIDS Report on the Global AIDS Epidemic, 2010*. Geneva: UNAIDS.

Immediately following infection with HIV, billions of infectious particles are produced every day. For a time, the immune system keeps pace, also producing billions of new cells. Unlike the virus, however, the immune system cannot make new cells indefinitely; as long as the virus keeps replicating, it wins in the end. The destruction of the immune system is signaled by the loss of CD4 T cells (Figure 18.1). As CD4 cells decline, an infected person may begin to experience mild to moderately severe symptoms. A person is diagnosed with AIDS when he or she develops one of the conditions defined as a marker for AIDS or when the number of CD4 cells in the blood drops below a certain level ($200/\mu\text{l}$). People with AIDS are vulnerable to a number of serious—often fatal—**opportunistic (secondary) infections**.

The first weeks after being infected with HIV are called the *primary infection* phase. Most, but not all, infected people develop flulike symptoms about two to four weeks after being exposed to the virus. During primary HIV infection, people have large amounts of HIV in the bloodstream and genital fluids, making it easier to transmit the virus. Several months later, infected people develop antibodies to the virus,

so commonly available tests will show a positive result. The next phase of HIV infection is the chronic **asymptomatic** (symptom-free) stage, also called the *latency* phase. This period can last from 2 to 20 years, averaging 11 years in untreated adults. During this time, the virus progressively infects and destroys the cells of the immune system. People infected with HIV can transmit the disease to others, even if they are

HIV infection A chronic, progressive viral infection that damages the immune system.

TERMS

CD4 T cell A type of white blood cell that helps coordinate the activity of the immune system; the primary target for HIV infection. The decrease in the number of these cells correlates with the severity of HIV-related illness.

opportunistic (secondary) infection An infection caused when organisms take the opportunity presented by a primary (initial) infection to multiply and cause a new, different infection.

asymptomatic Showing no signs or symptoms of a disease.

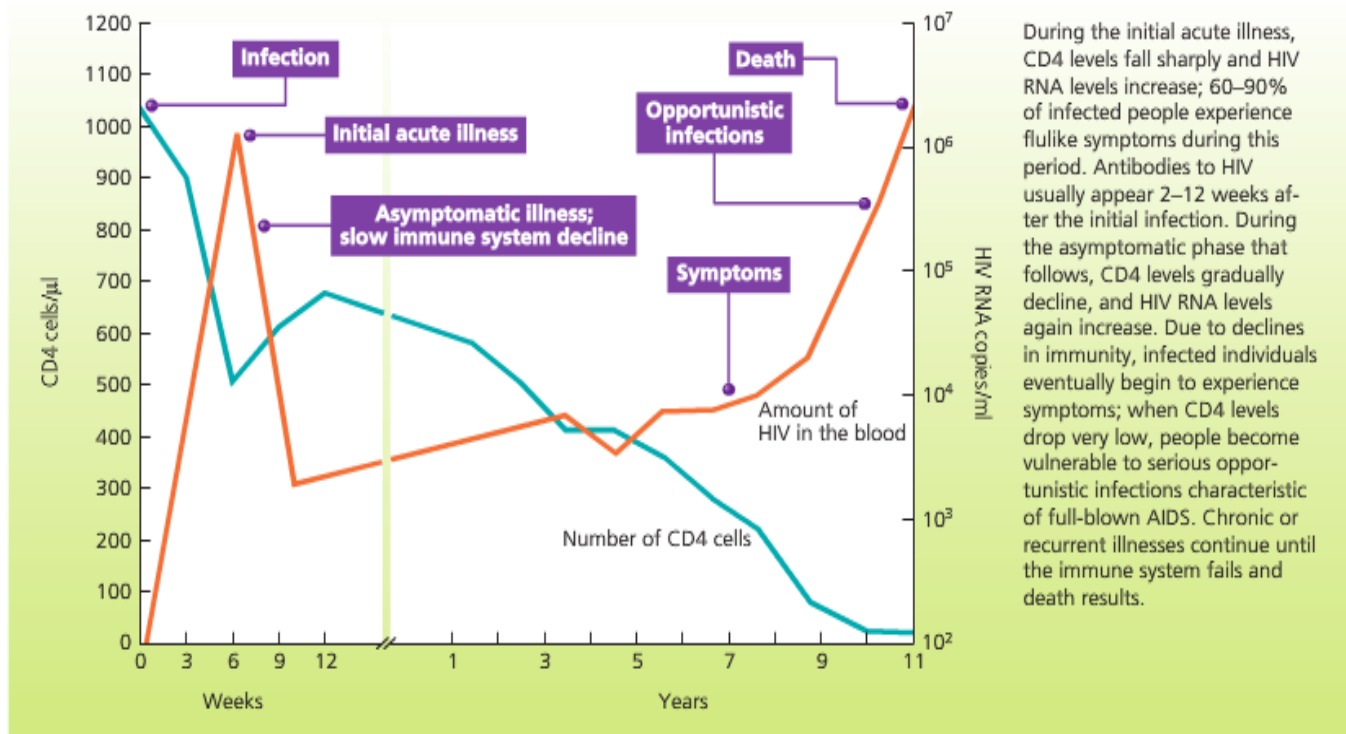


FIGURE 18.1 The general pattern of untreated HIV infection. The blue line represents the number of CD4 cells in the blood, a marker for the status of the immune system. The orange line shows the amount of HIV RNA in the blood.

SOURCE: Adapted from A. S. Fauci and Giuseppe Pantaleo, 1996, Immunopathogenic mechanisms of HIV infection, *Annals of Internal Medicine* 124(7), 654–663, Figure 1. Reprinted with permission of the American College of Physicians.

symptom-free. Even if they receive treatment, they remain infectious to varying degrees throughout their lives.

Transmitting the Virus HIV lives only within cells and body fluids, not outside the body. It is transmitted by blood and blood products, semen, vaginal and cervical secretions, and breast milk. It cannot live in air, in water, or on objects or surfaces such as toilet seats, eating utensils, or telephones. A person is not at risk of getting HIV infection by being in the same classroom, dining room, or even household with someone who is infected.

There are three main routes of HIV transmission:

- Specific kinds of sexual contact.
- Direct exposure to infected blood.
- Contact between an HIV-infected woman and her child during pregnancy, childbirth, or breastfeeding.

SEXUAL CONTACT HIV is more likely to be transmitted by unprotected anal or vaginal intercourse than by other sexual activities. During vaginal intercourse, male-to-female transmission is more likely to occur than female-to-male transmission. HIV has been found in preejaculatory fluid, so transmission can occur before ejaculation. Being the receptive partner during

QUICK STATS

The incidence of HIV in the United States has leveled off, with about 50,000 new infections annually.

—CDC, 2011

unprotected anal intercourse is the riskiest of all sexual activities. Oral–genital contact carries some risk of transmission, although less than anal or vaginal intercourse. HIV can be transmitted through tiny tears, traumatized points, or irritated areas in the lining of the vagina, cervix, penis, anus, mouth, and throat and through direct infection of cells in these areas. Sexual assault is an important factor in the transmission of HIV throughout the world. Protection is almost never used during sexual assault, and tissue trauma is generally greater than in unforced sexual activity.

The presence of lesions, blisters, or inflammation from other STDs in the genital, anal, or oral areas makes it two to nine times easier for the virus to be passed. Spermicides may also cause irritation and increase the risk of HIV transmission. Studies of the widely used spermicide nonoxynol-9 (N-9) have found that frequent use may cause vaginal and rectal irritation, increasing the risk of transmission of HIV and other STDs. The World Health Organization (WHO) recommends that spermicides containing N-9 not be used for protection against HIV and STDs. Condoms or lubricants with N-9 should never be used during anal intercourse because N-9 damages the lining of the rectum, providing an entry point for HIV and other STDs. Recent studies show that some other commonly used lubricants can also cause rectal irritation (see the

WELLNESS ON CAMPUS

The Riskiest Sexual Behavior Is Becoming More Common



According to the National Survey of Family Growth, published by the CDC in 2011, about 44% of heterosexual men and 36% of women aged 25–44 reported having anal sex at least once, compared with about 26% of men and 20% of women in a similar study performed a decade earlier. And according to the spring 2011 American College Health Association National College Health Assessment, about 27% of male students and about 22% of female students reported having had anal sex.

Although many people associate anal sex with gay sex, heterosexual anal sex is common. The majority of gay men report having had anal sex, although the practice is not universal. Taking into account the fact that heterosexuals far outnumber gay people, the vast majority of anal sex is occurring between heterosexual couples. Educational efforts about the risks of anal sex have been geared toward gay men, missing a much larger group at risk for STD transmission due to anal sex.

Like every type of sexual contact, anal sex can have serious health consequences. Couples who practice anal sex need to understand these consequences and minimize their risks. Unprotected anal sex (without using a condom) is the riskiest of all sexual behaviors. The risk of HIV transmission may be 20 times higher in unprotected anal sex than in unprotected vaginal sex. Anal sex is associated with high transmission levels of all the common STDs.

Why is anal sex so risky? Anal tissues are much more delicate and easily damaged than vaginal tissue. The vaginal opening is more elastic and wider than the anal opening. The natural fluids that provide lubrication in the vagina are absent in anal tissue. Even gentle penetration of the anus tends to create small tears

that infectious agents can easily enter. Health risks are generally greatest for the receptive partner, but the insertive partner is also at high risk for transmission of infection. Condom use reduces the risk, but only a minority of people use condoms consistently for anal sex. Among students who reported having had anal sex in the last 30 days, fewer than one-third typically used condoms. Some heterosexual couples use anal sex as a form of contraception when they don't have a condom available. Although condoms provide some protection, it is not uncommon for condoms to break during anal sex.

If people choose to have anal sex, how can it be made safer? Traditionally health providers have recommended that plenty of non-oil-based lubricant should be used along with a condom during anal intercourse to avoid tissue trauma, which increases the likelihood of STD transmission.

Currently only male condoms are approved for use in anal sex, but some experts believe that the female condom could also be effective and could provide the receptive partner with more control in protecting himself or herself against STDs. The currently available FC2 female condom was not designed for this purpose, but several researchers are looking into the possibility of reengineering the female condom and testing its effectiveness for anal intercourse.

Given the health risks, the choice to abstain from anal sex is reasonable and should be respected by partners. Besides the risk of STDs, repeated or forceful anal intercourse can cause anal fissures, ulcers, hemorrhoids, rectal prolapse, and stool incontinence. The choice to have anal intercourse is very personal and should be made with the knowledge of its inherent risks.

box "The Riskiest Sexual Behavior Is Becoming More Common").

The risk of HIV transmission during oral sex is generally considered to be low but may be increased if a person has oral sores or other damage to the gums or tissues in the mouth.

Studies in developing nations with high rates of HIV infection have found that circumcised males have a lower risk of HIV infection than uncircumcised males. Circumcision is uncommon in most parts of the world, but these findings are heightening interest in the practice. In the United States, where circumcision is common and HIV infection rates are much lower, circumcision does not appear to offer any significant protection against HIV.

DIRECT CONTACT WITH INFECTED BLOOD Direct contact with the blood of an infected person is another major route of HIV transmission. Needles and syringes used to inject drugs (including heroin, cocaine, and anabolic steroids) are usually contaminated with the user's blood. If needles are shared, small amounts of one person's blood are injected directly into another person's bloodstream. HIV may be transmitted through subcutaneous

Although
circumcision
offers some
protection
against HIV in
developing
countries, that is
not the case in the
United States.

and intramuscular injection as well, from needles or blades used in acupuncture, tattooing, body piercing, and ritual scarring.

In the past, before effective screening was available, some people were infected with HIV through blood transfusions and other medical procedures involving blood products. All blood in licensed U.S. blood banks and plasma centers is now thoroughly screened for HIV. However, the blood supply is much less safe in the rest of the world. The WHO estimates that about 5% of all cases of HIV infection worldwide have resulted from the transfusion of infected blood and blood products.

A small number of health care workers have acquired HIV on the job. Most of these cases involve needle sticks, in which a health care worker is accidentally stuck with a needle used on an infected patient. The likelihood of a patient acquiring HIV infection from a health care worker is almost negligible; the risk to health care workers from infected patients is much greater.

MOTHER-TO-CHILD TRANSMISSION The final major route of HIV transmission is mother-to-child, also called *vertical* or

perinatal transmission, which can occur during pregnancy, childbirth, or breastfeeding. Without intervention, the likelihood of HIV transmission from mother to child is 20–45%; however, transmission may be prevented by providing antiretroviral medications to both mother and child during those stages in which transmission is known to occur. Under ideal conditions of treatment and providing replacement feeding, mother-to-child transmission could be reduced to fewer than 2% of babies born to HIV-infected mothers. Worldwide, about two-thirds of vertical transmissions occur during pregnancy and childbirth and one-third through breastfeeding. In the United States and other developed countries, new treatments to reduce vertical transmission are in use, and new cases of this type of HIV infection have declined significantly since 1992.

Populations of Special Concern for HIV Infection

In 2009 the CDC estimated that 76% of HIV-positive Americans were men. Among Americans with AIDS, the most common means of HIV exposure is sexual activity between men (Figure 18.2). Each year the largest number of new cases of HIV infections is among men who have sex with men (MSM). In 2009 this group accounted for 61% of all HIV infections, even though they are estimated to represent just 2% of the population. Young men in particular are at risk, in part because they tend to engage in unsafe sexual practices such as unprotected anal intercourse. Drug and alcohol use has also been associated with risky sexual behavior and is directly or indirectly associated with HIV acquisition in this population. Use of methamphetamine and club drugs, as well as the recreational use of erectile dysfunction drugs, has been associated with risky sexual behavior and HIV infection in MSM.

Disproportionately high rates of HIV infection also occur in certain racial and ethnic groups, as well as among the poor. In 2009 blacks represented 44% of new HIV cases even though they make up only 14% of the U.S. population. Black men represented almost one-third of all new HIV infections. Black women accounted for 57% of new HIV infections among

women; most were infected through heterosexual sex. Hispanics accounted for 20% of all new HIV infections in 2009; they represent 16% of the population.

These patterns of HIV infection reflect complex social, economic, and behavioral factors. Reducing the rates of HIV transmission and AIDS death in minorities, women, and high-risk groups requires addressing problems of poverty, discrimination, and drug abuse. HIV prevention programs must be tailored to meet the special needs of minority communities and include testing, education, and equal access to health care.

Symptoms Within a few days or weeks of infection with HIV, most people will develop symptoms of primary (also called acute) HIV infection. These can include fever, fatigue, rashes, headache, swollen lymph nodes, body aches, night sweats, sore throat, nausea, and ulcers in the mouth. Symptoms can last from a few days to more than a month. Because these symptoms are similar to those of many common viral illnesses, the condition often goes undiagnosed.

Diagnosis of HIV at this very early stage of infection is extremely beneficial. People with early-stage HIV can make lifestyle changes to improve their overall health during this period. They can also protect their partners during this phase, when viral levels are very high. Whether to start drug treatment for HIV at this stage is somewhat controversial and depends on a number of factors; thus it is important to see a knowledgeable clinician to help make that decision.

Other than the initial flulike symptoms, most people have few if any symptoms in the first months or years of HIV infection. As the immune system weakens, however, a variety

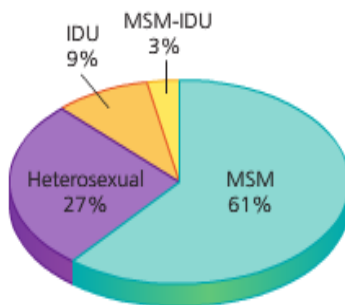
of symptoms can develop—persistent swollen lymph nodes; lumps, rashes, sores, or other growths on or under the skin or on the mucous membranes; persistent yeast infections; unexplained weight loss; fever and drenching night sweats; dry cough and shortness of breath; persistent diarrhea; easy bruising and unexplained bleeding; profound fatigue; memory loss; difficulty with balance; tremors or seizures; changes in vision, hearing, taste, or smell; changes in mood and other psychological symptoms; and persistent or recurrent pain. Many of these symptoms can also occur with a variety of other illnesses.

Because the immune system is weakened, people with HIV infection are highly susceptible to opportunistic infections, as noted earlier. The infection most often seen in the United States among people with HIV is *Pneumocystis pneumonia*, a fungal infection. **Kaposi's sarcoma**, a previously rare form of cancer, is common in HIV-infected men. Women with HIV

QUICK STATS

54% of Americans aged 18–64 have been tested for HIV at least once.

—Kaiser Family Foundation, 2011



* MSM = Men who have sex with men
IDU = Injection drug users

FIGURE 18.2 Routes of HIV Transmission among Americans

SOURCE: Centers for Disease Control and Prevention. 2012. *AIDS in the United States: At a Glance* (http://www.cdc.gov/hiv/resources/factsheets/PDF/HIV_at_a_glance.pdf).

Pneumocystis pneumonia A fungal infection common in people infected with HIV.

Kaposi's sarcoma A form of cancer characterized by purple or brownish lesions that are generally painless and occur anywhere on the skin; usually appears in men infected with HIV.

TERMS

CRITICAL CONSUMER

Getting an HIV Test



You should strongly consider being tested if any of the following apply to you or any past or current sexual partners:

- You have had unprotected sex (vaginal, anal, or oral) with more than one partner or with a partner who was not in a mutually monogamous relationship with you.
- You have used or shared needles, syringes, or other paraphernalia for injecting drugs (including steroids).
- You have exchanged sex for drugs or money.
- You received a transfusion of blood or blood products between 1978 and 1985.
- You have ever been diagnosed with hepatitis, tuberculosis, or an STD.

If you decide to be tested, you can have the test done by a health care provider or you can take a home test.



anonymously, ask your physician about an anonymous test, or use a home test.

Home Testing

Home test kits for HIV cost about \$40–70. Avoid test kits sold on the Internet that are not FDA-approved. As of this printing, the only FDA-approved home test kit for HIV is manufactured by Home Access. To use the Home Access test, you prick a finger with a supplied lancet, blot a few drops of blood onto blotting paper, and mail it to the company's laboratory. In about a week (or within three business days for more expensive "express" tests), you call a toll-free number to find out your results. Anyone testing positive is routed to a trained counselor, who can provide emotional and medical support. Approval of another home test, the OraQuick HIV test, manufactured by OraSure, was recommended to the FDA by an FDA advisory panel in 2012. Like the OraSure test available to clinics, the OraQuick home test uses a sample taken from the mouth and returns results in 20 minutes. The results of home test kits are completely anonymous.

The results of home test kits are completely anonymous.

Physician or Clinic Testing

Your physician, student health clinic, Planned Parenthood, public health department, or local AIDS association can arrange your HIV test. Testing usually costs \$50–\$100, but public clinics often charge little or nothing. The standard test involves drawing a sample of blood that is sent to a lab, where it is checked for antibodies. If the first stage of testing is positive, a confirming test is done. This standard test takes one to two weeks, and you'll be asked to phone or come in personally to obtain your results, which should also include appropriate counseling.

Alternative tests are available at some clinics. The OraSure test uses oral fluid, which is collected by swabbing the inside of the mouth. Urine tests are also available. New rapid tests are now also available at some locations. These tests involve the use of blood or oral fluid and can provide results in as little as 20 minutes. If a rapid test is positive for HIV infection, a confirming test will be performed.

Before you get an HIV test, be sure you understand what will be done with the results. Results from confidential tests may still become part of your medical record and be reported to state and federal public health agencies. If you decide you want to be tested

Understanding the Results

A negative test result means that no antibodies were found in your sample. However, as noted in the text, it usually takes at least a month after exposure to HIV (and possibly as long as six months in some people) for antibodies to appear. Therefore, an infected person may get a false negative result. If you test negative but your risk of infection is high, ask about obtaining an HIV RNA assay, which allows very early diagnosis.

A positive result means that you are infected. It is important to seek medical care and counseling immediately. Rapid progress is being made in treating HIV, and treatments are potentially much more successful when started early. For more information about testing, visit the CDC National HIV and STD Testing Resources website (www.hivtest.org).

infection often have frequent and difficult-to-treat vaginal yeast infections. Cases of tuberculosis (TB) are increasingly being reported in people with HIV, and the CDC recommends TB testing for anyone with HIV infection.

Diagnosis The most commonly used screening tests for HIV are **HIV antibody tests**. Standard testing involves an initial test called an **ELISA**; if it is positive, a second test—either a **Western blot** or immunofluorescence assay—is done to confirm the results (see the box "Getting an HIV Test").

HIV antibody test A blood test to determine whether a person has been infected by HIV; becomes positive within weeks or months of exposure.

ELISA (enzyme-linked immunosorbent assay) A blood test that detects the presence of antibodies to HIV.

Western blot A blood test that detects the presence of HIV antibodies; a more accurate and more expensive test used to confirm positive results from an ELISA test.

connect
ACTIVITY
DO IT ONLINE

TERMS

Antibodies may not appear in the blood for weeks or months after infection, so people who are newly infected are likely to have a negative antibody test. In its early stages, the infection can be detected with an **HIV RNA assay**, which directly measures the presence of the virus in the blood.

If a person is diagnosed as **HIV-positive**, the next step is to determine the disease's severity to plan appropriate treatment. The status of the immune system can be gauged by taking CD4 T cell measurements every few months. The infection itself can be monitored by tracking the viral load (the amount of virus in the body) through the HIV RNA assay.

Many people are not aware that rapid HIV tests, home tests, and tests that do not require a blood sample are now available. Rapid HIV tests, with results in less than one hour, are effective.

A new diagnostic test that may help guide treatment decisions is called HIV Replication Capacity. This test shows how fast HIV from a patient's blood sample can reproduce

In many people, combination therapies can reduce HIV in the blood to undetectable levels.

itself. It is a measure of viral fitness and may be helpful when used in conjunction with CD4 and viral load tests in predicting how quickly a given person may progress to more serious disease.

Someone who was recently exposed to HIV and has a negative antibody test should have the test repeated in a few months. Periodic routine testing is the best way for anyone to find out if he or she is infected with HIV. The frequency of testing depends on multiple factors. For example, the CDC recommends that men who have sex with men be tested at least once a year. People who engage in high-risk behavior should be

HIV RNA assay A test used to determine the viral load (the amount of HIV in the blood).

TERMS

HIV-positive A diagnosis resulting from the presence of HIV in the bloodstream; also referred to as *seropositive*.

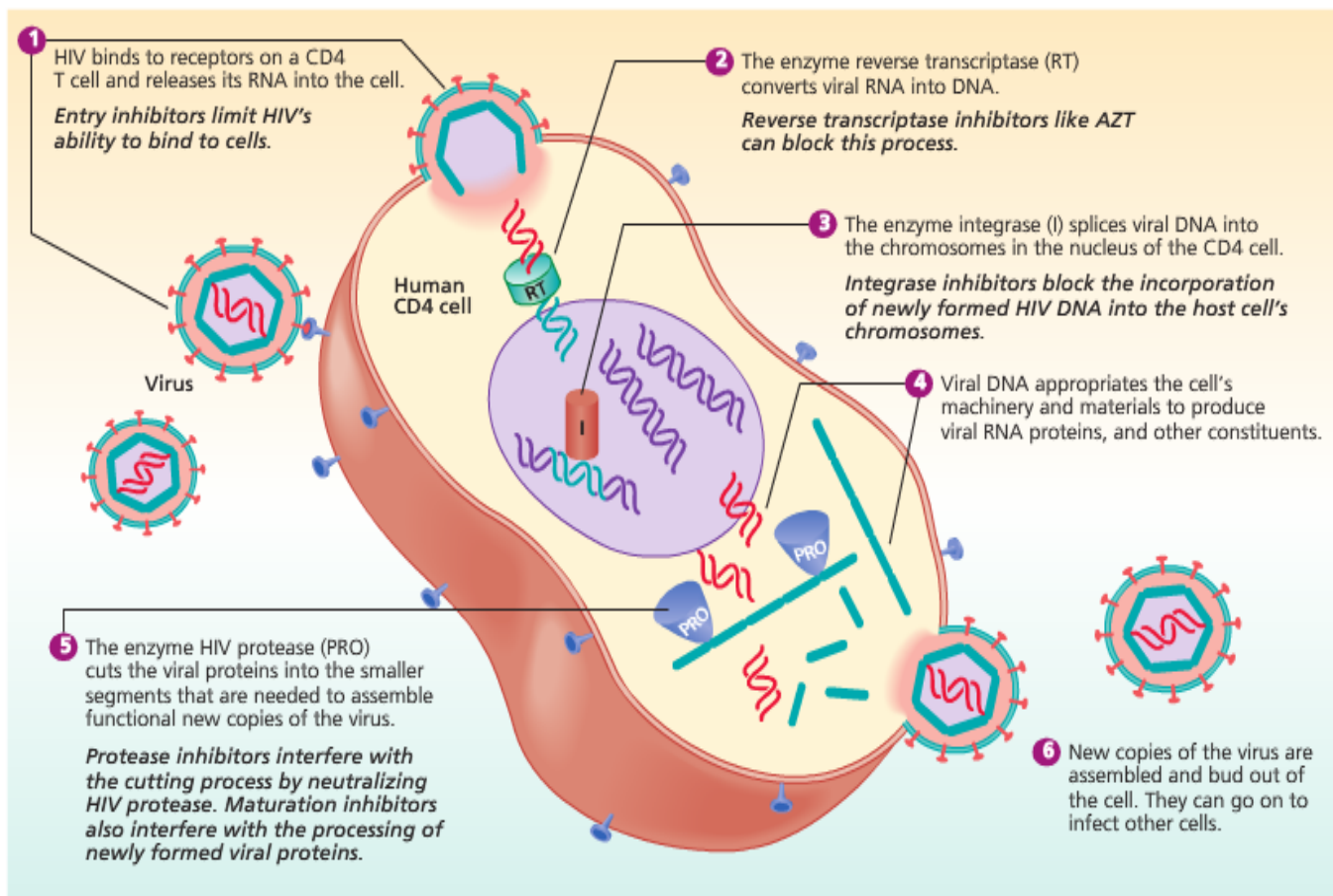


FIGURE 18.3 The life cycle of HIV: How antiviral drugs work. Different classes of drugs block the replication of HIV at different points in the virus's life cycle.

SOURCES: Baylor College of Medicine. 2010. *HIV/AIDS* (<http://www.bcm.edu/molvir/eidbt/eidbt-mvm-hiv aids.htm>; retrieved November 20, 2010).

tested more often. Rather than testing only at-risk individuals, the CDC also recommends universal HIV testing as part of routine medical care for everyone aged 13–64. The CDC hopes that routine HIV testing will increase the likelihood that people with HIV will be diagnosed earlier.

A diagnosis of AIDS, the most severe form of HIV infection, is given if a person is HIV-positive and either has developed an infection defined as an AIDS indicator or has a severely damaged immune system (as measured by CD4 T-cell counts).

In the United States, every state has laws that require doctors, clinics, and laboratories to report all diagnosed cases of HIV and AIDS to public health authorities, who use this information to track the spread of the disease. A new blood test makes it possible to estimate the length of time a person has been infected with HIV, so the CDC is now able to get a fairly accurate picture of the HIV epidemic in the United States. Despite efforts to safeguard confidentiality and prohibit discrimination, mandatory reporting of HIV infection remains controversial. If people believe they are risking their jobs, friends, or social acceptability, they may be less likely to get tested. The CDC recommends that states continue to provide opportunities for people to be tested anonymously, including via home tests.

Treatment Although there is no known cure for HIV infection, medications can significantly alter the course of the disease and extend life. The drop in the number of U.S. AIDS deaths that has occurred since 1996 is in large part due to the increasing use of combinations of new drugs.

The main types of antiviral drugs used against HIV/AIDS are reverse transcriptase inhibitors, protease inhibitors, integrase inhibitors, and entry inhibitors. These drugs either block HIV from replicating itself or prevent it from infecting other cells (Figure 18.3). Research has shown that using combinations of antiviral drugs can sometimes reduce HIV in the blood to undetectable levels. More than 30 drugs are now available to treat HIV, including two once-a-day tablets (containing three combined HIV medications). However, people on antiviral drugs can still transmit the infection, and concerns are growing that even these very aggressive treatments are starting to fail and that drug-resistant strains of HIV are developing rapidly. In addition to antiviral drugs, most patients with low CD4 T cell counts take a variety of antibiotics to help prevent opportunistic infections such as pneumonia, tuberculosis, and other bacterial and fungal infections.

In some cases medications are used to prevent infection in people who have been exposed to HIV, such as victims of sexual assault and health care workers with potential exposure to HIV-infected blood or body fluids. This type of treatment, called postexposure prophylaxis (PEP), should begin as soon as possible after exposure, but always within 72 hours. PEP treatment usually lasts 28 days.



Currently available treatments can significantly increase the chance that this child, born to an HIV-infected mother, will be free of the virus.

The cost of treatment for HIV continues to be an area of major concern. Costs are tremendous even for relatively wealthy countries, but 95% of people with HIV infection live in developing countries, where treatments are unlikely to be available to anyone except the wealthiest few. Pharmaceutical companies, the World Bank, and the international community are working to lower drug costs and provide aid for developing regions.

HIV treatment is also challenging because taking the combination drugs is complicated, and the drugs have short-term side effects that may cause people to stop taking them. Drug resistance develops quickly if the medicines are taken inconsistently. The drugs can also have long-term side effects, including serious health problems. The National Institutes of Health has issued guidelines for HIV treatment that help patients and their doctors with decisions about treatment. Generally people with HIV who have no symptoms and have relatively high CD4 counts may opt to delay treatment. All pregnant women, however, should receive treatment.

Prevention The best hope for stopping the spread of HIV worldwide is the development of a safe, effective, and inexpensive vaccine. Many different approaches to the development of an AIDS vaccine are currently under investigation. However, no vaccine is likely to be ready for widespread use within the next decade. Researchers are making more rapid progress in producing a **microbicide** that could be used to prevent HIV and other STDs. A microbicide in the form

microbicide Microbicide is a disinfectant that kills microorganisms and their spores.

TERMS

of a cream, gel, sponge, or suppository could function as a kind of chemical condom.

How Can You Protect Yourself? Although AIDS cannot be cured, infection can be prevented. You can protect yourself by avoiding behaviors that may bring you into contact with HIV. This means making careful choices about sexual activity and not sharing needles if you inject drugs.

In a sexual relationship, the current and past behaviors of you and your partner determine the amount of risk involved. If you are uninfected and in a mutually monogamous relationship with another uninfected person, you are not at risk for HIV. For anyone not involved in a long-term, mutually monogamous relationship, abstinence from any sexual activity that involves the exchange of body fluids is the only sure way to prevent HIV infection (Figure 18.4).

Anal and vaginal intercourse are the sexual activities associated with the highest risk of HIV infection. If you have

intercourse, always use a condom. Use of a condom reduces the risk of transmitting HIV during all forms of intercourse. Condoms are not perfect, and they do not ensure risk-free sex; however, used properly, a condom provides a high level of protection against HIV. Experts also suggest the use of latex squares and dental dams as barriers during oral–genital or oral–anal sexual contact. As mentioned earlier, avoid using nonoxynol-9 lubricants because of the risk of tissue irritation, which can make STD transmission more likely.

People who inject drugs should avoid sharing needles, syringes, filters, or anything that might have blood on it. Needles can be decontaminated with a solution of bleach and water, but this is not a foolproof procedure, and HIV can survive in a syringe for a month or longer. HIV can also survive boiling. As described in Chapter 9, obtaining sterile syringes through a syringe exchange

program is much more effective than attempting to sterilize used syringes.

Until an effective vaccine and a cure are found, HIV infection will remain one of the biggest challenges of this generation. Education and individual responsibility can lead the way to ending this epidemic (see the box “Preventing STD Infection”). Learn more about ways to stop the spread of HIV at www.actagainstaids.org.

Condom use reduces the risk of transmitting HIV during all forms of intercourse.



FIGURE 18.4 What's risky and what's not: The approximate relative risk of HIV transmission of various sexual activities.

Chlamydia

Chlamydia trachomatis causes **chlamydia**, the most prevalent bacterial STD in the United States. According to the CDC, more than 1.3 million new cases of chlamydia were officially reported in 2010—a slight increase from the previous year. Many experts believe, however, that chlamydia is vastly underreported because it is often asymptomatic; they estimate that as many as 3 million new cases of the disease occur each year. *C. trachomatis* can be transmitted by oral and anal sex as well as by other forms of sexual intercourse. Having a chlamydia infection increases the risk of HIV transmission.

Both men and women are susceptible to chlamydia, but, as with most STDs, women bear the greater burden because of possible complications and consequences of the disease. Rates of chlamydia in women were more than 2.5 times those in men in 2010. For women, the highest rates of infection occur among 15- to 24-year-olds. For men, the highest rates occur among 20- to 24-year-olds. Black men and women experience chlamydia infections at nearly eight times the rate of white men and women (Table 18.4).

In most women, chlamydia produces no early symptoms. If left untreated, it can lead to pelvic inflammatory disease (PID), which is discussed later in this chapter. Chlamydia

chlamydia An STD transmitted by the bacterium *Chlamydia trachomatis*.

TERMS

TAKE CHARGE Preventing STD Infection



For those who aren't in a long-term monogamous relationship with an uninfected partner, abstinence is the only truly safe option for avoiding STDs. Remember that it's OK to say no to sex and drugs.

If you are sexually active, talk with potential partners about HIV, safer sex, and condom use before you begin a sexual relationship. The following guidelines can also help you avoid infection:

- Don't drink alcohol or use drugs in sexual situations. Mood-altering drugs can affect your judgment and make you more likely to take risks. Having sex when intoxicated significantly increases the risk of exposure to STDs.
- Limit the number of partners. Avoid sexual contact with people who have HIV or an STD or who have engaged in risky behaviors in the past, including unprotected sex and injection drug use.
- Use condoms during every act of intercourse and oral sex. Condoms do not provide perfect protection, but they greatly reduce your risk of contracting an infection. Multiple studies show that regular condom use can reduce the risk of several diseases, including HIV, chlamydia, gonorrhea, HPV, and genital herpes.
- Use condoms properly for maximum protection; follow the condom use guidelines listed in Chapter 6.
- Avoid sexual contact that could cause cuts or tears in the skin or tissue.

- Get periodic screening tests for STDs and HIV. Sexually active young women should be tested for STDs at least annually. Women should have a Pap test at age 21 and every three years thereafter. More frequent screening may be recommended for women who have compromised immune systems.

- Get vaccinated. All sexually active men and women should be vaccinated against hepatitis B. All men who have sex with men should be vaccinated against hepatitis A. Young men and women aged 26 years and younger should consider getting vaccinated against HPV.

- Get prompt treatment for any STDs you contract. Make sure your partner gets treated, too. Don't have sex until both of you have completed your treatment.

If you inject drugs of any kind, don't share needles, syringes, or anything that might have blood on it. If your community has a syringe exchange program, use it. Seek treatment.

If you are at risk for HIV infection, don't donate blood, sperm, or body organs. Don't have unprotected sex or share needles or syringes. Get tested for HIV soon, and get treated. HIV-infected people who get early treatment generally feel better and live longer than those who delay.

also greatly increases a woman's risk for infertility and ectopic (tubal) pregnancy. The CDC currently recommends annual chlamydia testing for all sexually active women aged 25 or younger and for older women who are at increased risk (such as those who have multiple sex partners). Women who have a new sexual partner should consider being tested more often than once a year.



Accurate information about HIV/AIDS is available from many sources, including college health clinics, health professionals, and community organizations.

Chlamydia can also lead to infertility in men, although not as often as in women. In men under age 35, chlamydia is the most common cause of epididymitis, which is inflammation of the sperm-carrying ducts. In men, up to half of all cases of **urethritis**, inflammation of the urethra, are caused by chlamydia. Some experts feel that screening young sexually active men in addition to young women would be effective in reducing chlamydia rates. Both men and women can also acquire rectal chlamydial infections if they engage in unprotected anal receptive sex with an infected partner.

Infants of infected mothers can acquire the infection through contact with the pathogen in the birth canal during delivery. Every year over 150,000 newborns suffer eye infections and pneumonia as a result of untreated maternal chlamydial infections.

Symptoms Most people experience few or no symptoms from chlamydia infection, increasing the likelihood that they will inadvertently spread the infection to their partners. In men, chlamydia symptoms can include painful urination, a slight watery discharge from the penis, and sometimes pain around the

urethritis Inflammation of the tube that carries urine from the bladder to the outside opening.

TERMS

Table 18.4**Rates of Common STDs, per 100,000 Population, by Race/Ethnicity: 2010***

	CHLAMYDIA	GONORRHEA	SYPHILIS†
Whites	138.7	23.1	2.1
Blacks	1,167.5	432.5	16.8
Hispanics	369.6	49.9	4.6
Asians/Pacific Islanders	115.3	15.5	1.3
American Indians/ Alaska Natives	592.8	105.7	2.5

*As reported to the CDC. Rates are per 100,000 population.

†Primary and secondary stages.

SOURCE: Centers for Disease Control and Prevention. 2011. *Sexually Transmitted Disease Surveillance, 2010*. Atlanta: Centers for Disease Control and Prevention.

testicles. Women may notice increased vaginal discharge, burning with urination, pain or bleeding with intercourse, and lower abdominal pain. Symptoms in both men and women can begin within five days of infection.

Diagnosis and Treatment Chlamydia is diagnosed through laboratory tests on a urine sample or a small amount of fluid from the urethra, cervix, rectum, or vagina. Once chlamydia has been diagnosed, the infected person and his or her partner(s) are given antibiotics—usually doxycycline for a week or azithromycin, which can cure infection in one dose. Testing and treatment of partners is important. When it is unlikely that a partner will seek medical treatment, the CDC recommends that an extra prescription for antibiotics be provided to the patient to give to his or her partner. This strategy, called *expedited partner therapy*, is legal and encouraged under certain circumstances. It is important that both partners complete their treatment before resuming sexual activity. If a one-dose treatment is given, couples should wait for seven days after taking their medication to resume sexual activity. The CDC now recommends that women who have been treated for chlamydia be retested three months after treatment is completed because of the likelihood of reinfection.

Gonorrhea

Gonorrhea is caused by the bacterium *Neisseria gonorrhoeae*, which flourishes in mucous membranes. The microbe cannot thrive outside the human body and dies within moments of exposure to light and air. Consequently gonorrhea cannot be contracted from toilet seats, towels, or other objects.

More than 300,000 new cases of gonorrhea were reported to the CDC in 2010, a slight increase from the previous year.

Because the infection often causes no symptoms, only about 50% of actual infections are reported. The highest incidence is among 15- to 24-year-olds. Like chlamydia, untreated gonorrhea can cause PID in women and urethritis and epididymitis in men. It can also cause arthritis, rashes, and eye infections, and it occasionally involves internal organs. Being infected with gonorrhea increases the likelihood that HIV will be transmitted. An infant passing through the birth canal of an infected mother may contract *gonococcal conjunctivitis*, an infection in the eyes that can cause blindness if not treated. In most states, all newborn babies are routinely treated with antimicrobial eyedrops to prevent eye infection.

Symptoms In males the incubation period for gonorrhea is brief, generally two to seven days. The first symptoms are due to urethritis, which causes urinary discomfort and a thick, yellowish white or yellowish green discharge from the penis. The lips of the urethral opening may become inflamed and swollen. In some cases, the lymph glands in the groin become enlarged and swollen. Up to half of males have very minor symptoms or none at all.

Most females with gonorrhea are asymptomatic. Those who have symptoms often experience pain with urination, increased vaginal discharge, and severe menstrual cramps. Women may also develop painful abscesses in the Bartholin's glands, a pair of glands located on either side of the opening of the vagina. Up to 40% of women with untreated gonorrhea develop PID.

Gonorrhea can also infect the throat or rectum of people who engage in oral or anal sex. Gonorrhea symptoms in the throat may be a sore throat or pus on the tonsils, and those in the rectum may be pus or blood in the feces or rectal pain and itching.

Diagnosis and Treatment Gonorrhea is detectable through several tests; depending on the test, samples of urine or cervical, urethral, throat, or rectal fluids may be collected. Antibiotics are used to treat gonorrhea, but increasing drug resistance is a major concern. Only one class of antibiotics, the cephalosporins, remains consistently effective against gonorrhea. People with gonorrhea often also have chlamydia, so additional antibiotics are typically given to treat chlamydia.

QUICK STATS

In the United States, rates of gonorrhea are highest among adolescents and young adults.

—CDC, 2011

Pelvic Inflammatory Disease

Pelvic inflammatory disease (PID) is a major complication in 10–40% of women who have been infected with either

gonorrhea A sexually transmitted bacterial infection that usually affects mucous membranes.

pelvic inflammatory disease (PID) An infection that progresses from the vagina and cervix to the uterus, oviducts, and pelvic cavity.

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gonorrhea or chlamydia and have not received treatment. PID occurs when the initial infection travels upward beyond the cervix into the uterus, oviducts, ovaries, and pelvic cavity. PID is often serious enough to require hospitalization and sometimes surgery. Even if the disease is treated successfully, about 25% of affected women will have long-term problems, such as a continuing susceptibility to infection, ectopic pregnancy, infertility, and chronic pelvic pain.

PID is the leading cause of infertility in young women, often going undetected until the inability to become pregnant leads to further evaluation. Infertility occurs in 8% of women after one episode of PID, 20% after two episodes, and 40% after three episodes. About 100,000 women in the United States develop infertility as a result of PID each year. The risk of ectopic pregnancy, a medical emergency that can be fatal if not treated quickly, increases significantly in women who have had PID.

Women under age 25 are much more likely to develop PID than are older women. As with all STDs, the more sex partners a woman has had, the greater her risk of PID. Smokers have twice the risk of PID as non-smokers. Using IUDs for contraception increases the risk of PID, although this risk is greatly reduced for women with only one uninfected sexual partner.

Symptoms Symptoms of PID vary greatly. Some women, especially those with chlamydia, may be asymptomatic; others may have abdominal pain, fever, chills, nausea, and vomiting. Early symptoms are essentially the same as those described for chlamydia and gonorrhea. Symptoms often begin or worsen during or soon after a woman's menstrual period. Many women have abnormal vaginal bleeding—either bleeding between periods or heavy and painful menstrual bleeding.

Diagnosis and Treatment Diagnosis of PID is made on the basis of symptoms, physical examination, ultrasound, and laboratory tests. **Laparoscopy** may be used to confirm the diagnosis and obtain material for cultures.

Treatment should begin as quickly as possible to minimize damage to the reproductive organs. Antibiotics are usually started immediately; in severe cases, the woman may be hospitalized and antibiotics given intravenously. It is especially important that an infected woman's partners be treated. As many as 60% of the male contacts of women with PID are infected but asymptomatic.

Human Papillomavirus

Human papillomavirus (HPV) infection causes several diseases, including common warts, **genital warts**, and genital cancers. HPV causes virtually all cervical cancers, as well as

penile cancer and some forms of anal and oropharyngeal cancers (the oropharynx includes the back of the mouth and the throat). Genital HPV is usually spread through sexual activity, including oral sex.

HPV is the most common STD in the United States.

About 6.2 million Americans become infected with HPV each year. In all, more than 80% of sexually active people will have been infected with HPV by the age of 50. HPV is especially common in young people, with some of the highest infection rates among college students (see the box "College Students and STDs"). Many young women contract HPV infection within three months of becoming sexually active.

There are more than 100 different strains of HPV, and different strains cause different types of infection. More than 30 types are likely to cause genital infection. Types 16 and 18 are most often implicated in anal and genital cancers; types 6 and 11 cause most visible genital warts. A person can be infected with several different strains of HPV. Genital HPV infection is quite contagious.

Two HPV vaccines—Gardasil and Cervarix—have been approved by the FDA. Gardasil protects against four types of HPV virus that together account for 90% of genital warts and 70% of cervical cancers and most anal cancers. Gardasil has also been shown to prevent cancers of the vagina, vulva, and anus. Cervarix protects against two types of HPV but not against the type that causes genital warts. Some studies indicate that Cervarix may be more effective and may provide longer-lasting protection against the viral strains that cause cervical cancer.

Gardasil was originally approved for girls and women, but in 2009 it was also approved for boys and men aged 9–26 to prevent anal cancer. Many experts believe that it makes sense to routinely vaccinate young males for HPV to protect them from HPV-related diseases and to protect their female partners. Cervarix is approved for girls and women aged 10–25.

The CDC recommends the vaccine for all children between the ages of 11 and 12. This age was chosen because the vaccine is most effective when given prior to exposure to genital HPV, and this virus is so common that many young people

QUICK

STATS

The annual direct medical cost of STDs is **\$16.4 billion.**

—CDC, 2010

Although 80% of sexually active people become infected with HPV by age 50, most have no symptoms at all.

TERMS

laparoscopy A method of examining the internal organs by inserting a tube containing a small light through an abdominal incision.

human papillomavirus (HPV) The pathogen that causes human warts, including genital warts, as well as nearly all cases of cervical cancer.

genital warts A sexually transmitted viral infection characterized by growths on the genitals; also called *genital HPV infection* or *condyloma*. Persistence of this infection predisposes the infected person to some forms of genital cancers.



WELLNESS ON CAMPUS

College Students and STDs

Why Do College Students Have High Rates of STDs?

- Risky sexual behavior is common. One study of college students found that fewer than half used condoms consistently and one-third had had 10 or more sex partners. Another study found that 19% of male students and 33% of female students had consented to sexual intercourse simply because they felt awkward refusing.

- College students underestimate their risk of STDs and HIV. Although students may have considerable knowledge about STDs, they often feel the risks do not apply to them—a dangerous assumption. One study of students with a history of STDs showed that more than half had unprotected sex while they were infected, and 25% of them continued to have sex without ever informing their partner(s).

- Many students are infected but don't know it. A 2006 study of asymptomatic college women revealed that nearly 10% were infected with chlamydia.



- Students who binge-drink are more likely to have multiple partners, use condoms inconsistently, and delay seeking treatment for STDs than are students who drink little or no alcohol. Sexual assaults occur more frequently when either the perpetrator or the victim has been drinking.

What Can Students Do to Protect Themselves against STDs?

- Limit the number of sex partners. Even people who are always in a monogamous relationship can end up with extensive potential exposure to STDs if, over the years, they have numerous relationships.

- Use condoms consistently, and don't assume it's safe to stop after you've been with a partner for several months. HIV infection, HPV infection, herpes, and chlamydia can be asymptomatic for months or years and can be transmitted at any time. If you haven't been using condoms with your current partner, start now.

- Enjoy sexuality on your own terms. Don't let the expectations of friends and partners cause you to ignore your own feelings. Let your own wellness be your first priority. If you choose to be sexually active, learn about safer sex practices.

- Get to know your partner, and talk to him or her before becoming intimate. Be honest about yourself, and encourage your partner to do the same. But practice safer sex no matter what.

What Effect Does Alcohol or Drug Use Have on My Likelihood of Getting an STD?

- Between one-third and one-half of college students report participating in sexual activity as a direct result of being intoxicated. All too often, sexual activity while intoxicated leads to unprotected intercourse.

will be exposed to it shortly after becoming sexually active. Each of the vaccines requires three injections over a period of six months. (For more about HPV, see Chapter 16.)

Symptoms Most people infected with HPV have no visible warts or other symptoms and are not aware that they are infected and contagious to others. The good news is that the immune system usually clears the virus on its own, and infection disappears without any treatment. But in some cases, the infection persists and causes genital warts or cancers.

The types of HPV that cause cervical cancer do not produce any visible changes on the external genitals. The types that cause genital warts can produce anything from a small bump to a large, warty growth. Untreated warts can grow together to form a cauliflower-like mass. In males, they appear on the penis and often involve the urethra, appearing first at the opening and then spreading inside. The growths may cause irritation and bleeding, leading to painful urination and a urethral discharge. Warts may also appear around the anus or within the rectum. In women, warts may appear on the labia or vulva and may spread to the *perineum*, the area between the vagina and the rectum. They may also appear on the cervix.

The incubation period ranges from one month to two years from the time of contact. People can be infected with the virus and be capable of transmitting it to their sex partners without having any symptoms at all. The vast majority of people with HPV infection have no visible warts or symptoms of any kind.

Diagnosis and Treatment Genital warts are usually diagnosed based on the appearance of the lesions. HPV infection of the cervix is often detected on routine Pap tests. Special tests are now available to detect the presence of HPV infection and to distinguish among the more common strains of HPV, including those that cause most cases of cervical cancer.

Treatment of genital warts focuses on reducing the number and size of warts, although most warts eventually disappear, even without treatment. The currently available treatments do not eradicate HPV infection. Warts may be removed by cryosurgery (freezing), electrocautery (burning), or laser surgery. Direct applications of cytotoxic acids may be used, and there are treatments that patients can use at home. Even after treatment and the disappearance of visible warts, the individual may continue to carry HPV in healthy-looking tissue and can probably still infect others.

Cervical abnormalities that are cancerous or precancerous are treated surgically or with other techniques such as electrical excision, freezing, and laser. See Chapter 16 for more information about cervical cancer.

Anyone who has ever had HPV infection should inform all partners and use condoms, even though they do not provide total protection. Whether or not they have had the vaccine, all women should have regular pelvic exams and PAP tests. Women who have regular screening exams almost never develop full-blown cervical cancer.

Genital Herpes

Up to one in five adults in the United States has **genital herpes**. Worldwide, genital herpes is extremely common, and it is a major factor in the transmission of HIV. Most people with HIV are also infected with one form of herpes, and their herpes lesions contain large amounts of HIV, making it more likely that the virus will be transmitted. The presence of herpes lesions in an HIV-negative person increases the likelihood that she or he will be infected by an HIV-positive partner. Genital herpes may also interact with HPV infection to increase the risk of cervical cancer.

Two types of herpes simplex viruses, HSV 1 and HSV 2, cause genital herpes and oral-labial herpes (cold sores). Many people wrongly assume that they are unlikely to pick up an STD if they limit their sexual activity to oral sex, but this is not true, particularly in the case of genital herpes. Oral sex is a common way of acquiring herpes infections, particularly among young people. HSV can also cause rectal lesions, usually transmitted through anal sex. Infection with HSV is generally lifelong. After infection, the virus lies dormant in nerve cells and can reactivate at any time. The type of virus may determine how frequently genital outbreaks occur. Individuals with HSV 2 genital infections tend to have more frequent outbreaks of genital lesions and shed more virus without having symptoms compared to individuals with HSV 1 infections.

HSV 1 infection is so common that 50–80% of U.S. adults have antibodies to it (indicating previous exposure to the virus); most were exposed to HSV 1 during childhood. HSV 2 infection usually occurs during adolescence and early adulthood, often between ages 18 and 25. Approximately 16% of adults have antibodies to HSV 2; infection is more common in women (one in five women 14–49 years of age) than it is in men (one in nine men 14–49 years of age).

genital herpes A sexually transmitted infection caused by the herpes simplex virus.

TERMS

QUICK

STATS

More than 80% of people infected with genital herpes do not know they are infected.

—CDC, 2009

HSV 2 is almost always sexually transmitted. The infection spreads readily whether people have active sores or are completely asymptomatic. Because HSV is asymptomatic in 80–90% of people, the infection is often acquired from a person who does not know that he or she is infected. Transmission is more likely from an infected female to her male partner than from an infected male to his female partner.

If you have ever had an outbreak of genital herpes, you should consider yourself always contagious and inform your partners. Avoid intimate contact when any sores are present, and use condoms during all sexual contact. One study showed that using condoms for every act of intercourse results in a 30% decrease in the transmission of herpes compared with no condom use. Condoms are more effective in preventing the transmission of other STDs than for herpes, but this study shows that they can make a significant difference in preventing the spread of genital herpes.

Newborns can occasionally be infected with HSV, usually during passage through the birth canal of an infected mother. This is more likely to occur when HSV infection was acquired by the mother during the third trimester of pregnancy. Without treatment, 65% of newborns with HSV will die, and most

who survive will have some degree of brain damage. The risk of mother-to-child HSV transmission during pregnancy and delivery is low (less than 1%) in women with long-standing herpes infection. Some specialists recommend testing all pregnant women whose partners have a herpes infection. A woman whose partner has herpes should practice safe sex and abstain from sex in the late stages of pregnancy.

Pregnant women who have been exposed to genital herpes should inform their physicians so that appropriate precautions can be taken to protect their babies from infection. These precautions sometimes include a cesarean section if active lesions are present at the time of delivery.

Symptoms Up to 90% of people who are infected with HSV have no symptoms. Those who develop symptoms often first notice them within 2–20 days of having sex with an infected partner. (However, it is not unusual for the first outbreak to occur months or even years after initial exposure.) The first episode of genital herpes frequently causes flulike symptoms in addition to genital lesions. The lesions tend to be painful or itchy and can occur anywhere on the genitals, inner thighs, or anal area. Depending on their location, they can cause considerable pain with urination. Lymph nodes in the groin may become swollen and tender. The sores usually heal within three weeks.

On average, newly diagnosed people will experience five to eight outbreaks per year, with a decrease in the frequency of outbreaks over time. Recurrent episodes are usually less severe than the initial one, with fewer and less painful sores that heal more quickly. Outbreaks can be triggered by stress, illness,



EMBRACING WELLNESS

Stress and Genital Herpes

Patients and health care workers alike have long suspected that stress and genital herpes outbreaks are related. Research into this potential link has yielded mixed results. One study of women with genital herpes found that persistent stressors (those lasting more than a week) and persistent high levels of anxiety were associated with increased outbreaks. Short-term stress, mood changes, and brief negative life experiences did not influence the rate of herpes outbreaks.

Experts suspect that stress has a negative impact on the immune system. Studies have shown that immune function and antibody levels may drop in response to psychological stress. Perhaps herpes viruses that are usually dormant in nervous system tissue become activated when immune function declines due to stress.

Still to be investigated is whether stress reduction techniques such as meditation or exercise reduce rates of herpes outbreaks. Until such research becomes available, it makes sense for people who suffer recurrent genital herpes outbreaks to do what they can to reduce stress, especially long-term stress and anxiety (see Chapter 2). If you have herpes, joining a support group may help reduce your stress and improve your ability to cope with this chronic disease. If you have several outbreaks a year, or if you have recently had your first episode of genital herpes, talk to your health care provider about suppressive antiviral medication, which can reduce outbreaks substantially. Keep in mind that regardless of stress level, genital herpes outbreaks naturally tend to become less and less frequent over time. Knowing that your outbreaks are likely to diminish may, in and of itself, help reduce your feelings of stress.

fatigue, sun exposure, sexual intercourse, and menstruation (see the box “Stress and Genital Herpes”).

Diagnosis and Treatment Genital herpes can be diagnosed on the basis of symptoms, but laboratory testing is helpful if there is any question about the diagnosis. Several blood tests can detect the presence of HSV antibodies in the blood. Tests can also distinguish between HSV 1 and HSV 2 infection. This knowledge may help prevent transmission of HSV in couples where one partner is infected and the other is not (particularly important for uninfected women who are pregnant).

There is no cure for herpes. Once infected, a person carries the virus for life. Antiviral drugs such as acyclovir can be taken at the beginning of an outbreak to shorten the severity and duration of symptoms. Support groups are available to help people learn to cope with herpes. There is no vaccine to prevent herpes, but research is ongoing.

Hepatitis B

Hepatitis (inflammation of the liver) can cause serious and sometimes permanent damage to the liver, which can result in death in severe cases. One of the many types of hepatitis is caused by hepatitis B virus (HBV). Like HIV, HBV is found in most body fluids, including blood and blood products, semen, saliva, urine, and vaginal secretions. HBV is much more contagious than HIV. It is easily transmitted through any sexual activity that involves the exchange of body fluids. The primary risk factors for HVB are sexual

exposure and injection drug use; having multiple sex partners greatly increases risk. HBV can also be transmitted through nonsexual close contact, including the use of contaminated needles, razor blades, toothbrushes, and eating utensils. Because of crowded living conditions in many college settings, vaccination against HVB is recommended for incoming college students.

Other forms of viral hepatitis can also be sexually transmitted. Hepatitis A is of particular concern for people who engage in anal sex; a vaccine is available and is recommended for all people at risk. Less commonly, hepatitis C can be transmitted sexually. Experts believe that traumatic sexual activity that causes tissue damage is most likely to transmit hepatitis C. See Chapter 17 for more about these forms of hepatitis.



hepatitis Inflammation of the liver, which can be caused by infection, drugs, or toxins; some forms of infectious hepatitis can be transmitted sexually.

TERMS

Hepatitis B is a highly contagious STD that can easily spread among people who live in close contact with one another. Vaccination against hepatitis B is recommended for all college students.

Symptoms Many people infected with HBV never develop symptoms; they have what are known as silent infections. The normal incubation period is 30–180 days. Mild cases of hepatitis cause flulike symptoms such as fever, body aches, chills, and loss of appetite. As the illness progresses, there may be nausea, vomiting, dark-colored urine, abdominal pain, and jaundice. Some people with hepatitis also develop a skin rash and joint pain or arthritis. Acute hepatitis B can sometimes be severe, resulting in prolonged illness or even death.

Most adults who have acute hepatitis B recover completely within a few weeks or months. But about 5% of adults who are infected with HBV become chronic carriers of the virus, capable of infecting others for the rest of their life. Some chronic carriers remain asymptomatic, while others develop chronic liver disease. Chronic hepatitis can cause cirrhosis, liver failure, and a deadly form of liver cancer. Hepatitis kills some 5000 Americans each year; worldwide, the annual death toll exceeds 600,000.

Diagnosis and Treatment Hepatitis is diagnosed by blood tests used to analyze liver function, detect the infecting organism, and detect antibodies to the virus. There is no cure for HBV and no specific treatment for acute infections; antiviral drugs and immune system modulators may be used for chronic HBV infection.

The vaccine for hepatitis B is safe and effective. The number of cases of acute hepatitis B in the United States has dropped by more than 80% since 1990, primarily as a result of the vaccine. In addition, mother-to-child transmission has been greatly reduced because of routine HBV screening of pregnant women.

Vaccination against HBV is recommended for everyone under age 19 and for all adults at increased risk for hepatitis B, including people who have more than one sex partner in six months, men who have sex with other men, those who inject illegal drugs, and health care workers who are exposed to blood and body fluids. Vaccination is also recommended for anyone with a compromised immune system, such as people with HIV, diabetes, or advanced liver or kidney disease.

Syphilis

Syphilis, a disease that once caused death and disability for millions, can now be effectively treated with antibiotics. In 2010 there were 13,774 new cases of early syphilis in the United States, and about 45,834 people were diagnosed at all stages of the disease.

In 2010 overall rates of syphilis were lower than they had been in the previous 10 years. However, rates in young men who have sex with men were rising; rates of co-infection with HIV were also high in this group. In 2010, 67% of reported

early cases of syphilis were among men who have sex with men. Studies have found an association between syphilis infection and the use of the Internet as a means to meet sex partners among men who have sex with men.

Another trend is an increase in the proportion of cases of syphilis transmitted through oral sex. People with syphilis in the mouth may not have symptoms, or they may mistake the sores for another illness. The sores associated with syphilis, regardless of their location, dramatically increase the risk of acquiring HIV or transmitting it to someone else.

Syphilis is caused by a spirochete called *Treponema pallidum*, a thin, corkscrew-shaped bacterium. It requires warmth and moisture to survive and dies quickly outside the human body. The disease is usually acquired through sexual contact, although infected pregnant women can transmit it to their fetuses. The pathogen passes through any break or opening in the skin or mucous membranes and can be transmitted by kissing, vaginal or anal intercourse, or oral–genital contact. Although easy to treat, syphilis can be difficult to recognize, and if left untreated the disease can cause devastating damage to almost any system of the body.

Symptoms Syphilis progresses through several stages. *Primary syphilis* is characterized by an ulcer called a **chancre** that appears within 10–90 days after exposure. The chancre is usually found at the site where the organism entered the body, such as the genital area, but it may also appear in other sites such as the mouth, breasts, or fingers. Chancres contain large numbers of bacteria and make the disease highly contagious when present; they are often painless and typically heal on their own within a few weeks. If the disease is not treated during the primary stage, about a third of infected individuals progress to chronic stages of infections.

Secondary syphilis is usually characterized by a skin rash that appears three to six weeks after the chancre. The rash may cover the entire body or only a few areas, but the palms of the hands and soles of the feet are usually involved. Areas of skin affected by the rash are highly contagious but usually heal within several weeks or months. Other symptoms include patchy hair loss, weight loss, and symptoms that may resemble flulike illness such as fever, swollen lymph glands, sore throat, headaches, muscle aches, and fatigue.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever had sex and regretted it later? If so, what were the circumstances, and what influenced you to act the way you did? Were there any negative consequences? What preventive strategies can you use in the future to make sure it doesn't happen again?

syphilis A sexually transmitted bacterial infection caused by the spirochete *Treponema pallidum*.

TERMS



TAKE CHARGE

Don't Wait—Early Treatment of STDs Really Matters

If you have had a recent risky sexual encounter, visit your physician, student health center, or local STD clinic and ask for testing. Don't wait for symptoms to develop—you may never have any. Permanent damage from STDs, including infertility, can occur even if you have no symptoms. Treating STDs

like chlamydia and gonorrhea within a few days of infection is very likely to prevent complications such as PID and infertility. You will also be much less likely to pass the infection on to anyone else.

Unsafe sex with a person who is infected with HIV meets the criteria for PEP treatment described earlier in the chapter; if you are treated within 72 hours of possible exposure, PEP will significantly reduce your risk of HIV infection. If you develop flu-like symptoms in the days or weeks following risky sexual or drug-taking behavior, see your physician and ask for an HIV RNA test in addition to standard STD tests. (HIV antibody tests may not register primary HIV infection.) If HIV treatment is begun within the

first weeks of the infection, there is a good chance that damage to the immune system can be reduced or even prevented. Many physicians will not think of primary HIV infection when you describe flu-like symptoms, so be sure to speak up about your recent risky activities and your concerns about HIV.

If tests come back positive for a particular STD, you need to be tested for others, including HIV infection. Infection with any STD means that you are at higher risk for all others. Women should also have a pelvic exam and a Pap test.

If you are given medication to treat an STD, take all of it as directed. Incomplete treatment can result in an incomplete cure, thereby contributing to the development of drug-resistant organisms. Do not share your medication with a partner; he or she should see a physician for testing and treatment.

Do not have sexual intercourse until your treatment—and your partner's treatment—is complete. If your partner still carries the infection, you are likely to be reinfected when you resume sexual activity. If you have an incurable (viral) STD such as herpes or HPV infection, always use a condom and make sure your partner is fully informed of the potential risks of being intimate with you, even if you are using condoms.

connect
ACTIVITY
DO IT ONLINE

If the disease remains untreated, the symptoms of secondary syphilis may recur over a period of several years; affected individuals may then lapse into an asymptomatic latent stage in which they experience no further consequences of infection. However, in about one-third of cases of untreated secondary syphilis, the individual develops *late*, or *tertiary*, syphilis. Late syphilis can damage many organs of the body, possibly causing severe dementia, cardiovascular damage, blindness, and death.

In infected pregnant women, the syphilis bacterium can cross the placenta. If the mother is not treated, the probable result is stillbirth, prematurity, or congenital deformity. In many cases the infant is also born infected (*congenital syphilis*) and requires treatment.

Diagnosis and Treatment Syphilis is diagnosed by examination of infected tissues and with blood tests. All stages can be treated with antibiotics, but damage from late syphilis can be permanent.

Other STDs

A number of other diseases are also transmitted sexually.

Trichomoniasis (often called *trich*) is a common STD among young women. The CDC estimates that as many as 3–5 million new infections occur each year. The single-celled organism that causes trich, *Trichomonas vaginalis*, thrives in warm, moist conditions, making women particularly susceptible to these infections in the vagina. Women who become symptomatic with trich develop a greenish, foul-smelling vaginal discharge and severe itching and pain in the vagina.

Men usually have no symptoms, but may have mild irritation after urinating, or a slight discharge. Prompt treatment with metronidazole (Flagyl) is important because studies suggest that trich may increase the risk of HIV transmission and, in pregnant women, premature delivery.

Bacterial vaginosis (BV) is the most common cause of abnormal vaginal discharge in women of reproductive age. BV occurs when healthful bacteria that normally inhabit the vagina become displaced by unhealthful species. BV is usually, but not always, associated with sexual activity and often occurs after a change in partners. Symptoms of BV include vaginal discharge with a fishy odor and sometimes vaginal irritation. BV can place women at risk for other STDs, complications after some gynecological surgical procedures, and complications during pregnancy. BV is treated with topical and oral antibiotics.

Lymphogranuloma venereum (LGV) is an infection of the lymphatic system caused by three strains of the bacteria

chancere The sore produced by syphilis in its earliest stage.

trichomoniasis A protozoal infection caused by *Trichomonas vaginalis*, transmitted sexually and externally.

bacterial vaginosis (BV) A condition linked to sexual activity; caused by an overgrowth of certain bacteria inhabiting the vagina.

lymphogranuloma venereum (LGV) An infection of the lymphatic system caused by three strains of the bacterium *Chlamydia trachomatis*, transmitted sexually.

TERMS

Chlamydia trachomatis (not the same strain that causes the genital STD chlamydia). The incidence of LGV in the United States is unknown; however, outbreaks have occurred in the Netherlands and other European countries among men who have sex with men. LGV is more common in men than in women; the main risk factor is being HIV-positive. The first symptom is an ulcer at the site of sexual penetration that appears 3–30 days after exposure; there may also be swollen glands in the genital area. Among those who practice anal receptive intercourse, symptoms may include rectal ulcers, bleeding, and pain. If the infection is untreated, chronic symptoms may develop, so individuals with symptoms should see a physician.

Pubic lice (commonly known as *crabs*) and **scabies** are highly contagious parasitic infections. They are usually treated with topical medicines, but oral medications are sometimes needed as well. Lice infestation can require repeated treatment.

WHAT YOU CAN DO ABOUT STDs

You can take responsibility for your health and contribute to a general reduction in the incidence of STDs in three major areas: education, diagnosis and treatment, and prevention.

Education

Many schools have STD counseling and education programs. These programs allow students to practice communicating with potential sex partners and negotiating for safer sex, among other skills. You can find free pamphlets and literature about STDs at health clinics, physicians' offices, and Planned Parenthood. National hotlines provide free, confidential information and referral services to callers anywhere in the country (see "For More Information" at the end of the chapter).

Educational campaigns about HIV/AIDS and other STDs have paid off in changing attitudes and sexual behaviors. Levels of awareness about HIV infection among the general population are quite high, although some segments of the population are harder to reach and continue to engage in very high-risk behaviors. Learning about STDs is still up to every person individually, as is applying that knowledge to personal situations.

Diagnosis and Treatment

Early diagnosis and treatment of STDs can help you avoid complications and help prevent the spread of infection.

pubic lice Parasites that infest the hair of the pubic region, commonly called crabs.

scabies A contagious skin disease caused by a type of burrowing parasitic mite.

TERMS

- **Be alert for symptoms.** If you are sexually active, be alert for any sign or symptom of disease, such as a rash, a discharge, sores, or pain. Although only a physician can make a proper diagnosis of an STD, you can perform a genital self-examination between check-ups to look for early warning signs of disease, such as bumps, sores, blisters, or warts. Use a mirror to view your entire genital area. Remember, though, that many STDs can be asymptomatic, so a professional exam and testing are recommended following any risky sexual encounter.

- **Get vaccinated.** Every young, sexually active person should be vaccinated against hepatitis B; vaccines are available for all age groups. Men who have sex with men should be vaccinated against hepatitis A, and men and women aged 9–26 should be vaccinated against HPV.

- **Get tested.** The CDC recommends that everyone between the ages of 13 and 64 be tested for HIV at least once during routine medical care. If you are sexually active, be sure to get periodic STD checks, even if you have no symptoms. If you have a risky sexual encounter, see a physician as soon as possible (see the box "Don't Wait—Early Treatment of STDs Really Matters").

- **Inform your partners.** Telling a partner that you have exposed him or her to an STD isn't easy. Despite the awkwardness and difficulty, it is crucial that your sex partner or partners be informed and urged to seek testing and/or treatment as quickly as possible. You can get help telling your partner if you need it. Public health departments will notify sex partners of their possible exposure while maintaining your confidentiality and anonymity.



Condoms protect against STDs and should be used even if another form of contraception, such as birth control pills or an IUD, is being used.



ASSESS YOURSELF

Do Your Attitudes and Behaviors Put You at Risk for STDs?

To identify your STD risk factors, read the following statements and identify whether each one is true or false for you.

True or False

1. I have never been sexually active. (If false, continue. If true, you are not at risk; respond to the remaining statements based on how you realistically believe you would act.)
2. I am in a mutually monogamous relationship with an uninfected partner or am not currently sexually active. (If false, continue. If true, you are at minimal risk now; respond to the remaining statements according to your attitudes and past behaviors.)
3. I have only one sex partner.
4. I always use a condom for each act of intercourse, even if I am fairly certain my partner has no infections.
5. I do not use oil-based lubricants or other products with condoms.
6. I discuss STDs and prevention with new partners before having sex.
7. I do not use alcohol or another mood-altering drug in sexual situations.
8. I would tell my partner if I thought I had been exposed to an STD.
9. I am familiar with the signs and symptoms of STDs.
10. I regularly perform genital self-examinations.
11. When I notice any sign or symptom of any STD or if I engage in risky sexual behavior, I consult my physician immediately.
12. I obtain screening for HIV and STDs regularly. In addition (if female), I obtain yearly pelvic exams and Pap tests.
13. When diagnosed with an STD, I inform all recent partners.
14. When I have a sign or symptom of an STD that goes away on its own, I still consult my physician.
15. I do not use drugs prescribed for friends or partners or left over from other illnesses to treat STDs.
16. I do not share syringes or needles to inject drugs.

False answers indicate attitudes and behaviors that may put you at risk for contracting STDs or for suffering serious medical consequences from them. (For a more detailed self-assessment, take the quiz at www.thebody.com/surveys/sexsurvey.html.)

- **Get treated.** With the exception of AIDS treatments, treatments for STDs are safe and generally inexpensive. If you are being treated, follow instructions carefully and complete all the medication as prescribed. Don't stop taking the medication just because you feel better or your symptoms have disappeared. If you have an STD, your partner needs to be tested and, if necessary, treated.

Prevention

STDs are preventable. As discussed earlier, the only sure way to avoid exposure to STDs is to abstain from sexual activity. But if you choose to be sexually active, the key is to think about prevention *before* you have a sexual encounter or find yourself in the heat of the moment. To identify your STD risk factors, see the box "Do Your Attitudes and Behaviors Put You at Risk for STDs?" Find out what your partner thinks before you become sexually involved. By thinking and talking about responsible sexual behavior, you are expressing a sense of caring for yourself, your potential partner, and your future children.

TIPS FOR TODAY AND THE FUTURE

Because STDs can have serious, long-term effects, it's important to be vigilant about exposure, treatment, and prevention.

RIGHT NOW YOU CAN:

- Make an appointment with your health care provider if you are worried about possible STD infection.
- Resolve to discuss condom use with your partner if you are sexually active and are not already using condoms.

IN THE FUTURE YOU CAN:

- Learn how to communicate effectively with a partner who resists safer sex practices or is reluctant to discuss his or her sexual history. Support groups and educational classes can help.
- Make sure all your vaccinations are up-to-date; ask your doctor if you should be vaccinated against hepatitis A or B, HPV, or any other STDs.

Connect to Your Choices

Have you ever thought about where you get your behaviors and habits related to sexually transmitted diseases? Many factors can influence our behaviors and habits, some not as obvious as others. Did you have comprehensive sex education in high school? Do the significant people in your peer group use condoms and practice safer sex? Are you sometimes influenced by partners who don't want to use protection? Does your campus health clinic promote HIV/AIDS awareness?

What are the external factors that influence your choices about sexually transmitted diseases? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

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www.mcgraw-hillconnect.com

SUMMARY

- HIV affects the immune system, making an otherwise healthy person less able to resist a variety of infections.
- HIV is carried in blood and blood products, semen, vaginal and cervical secretions, and breast milk. HIV is transmitted through the exchange of these fluids.
- There is currently no cure or vaccine for HIV infection. Drugs have been developed to slow the course of the disease and to prevent or treat certain secondary infections.
- HIV infection can be prevented by making careful choices about sexual activity and not sharing drug needles.
- Chlamydia causes epididymitis and urethritis in men; in women, it can lead to PID and infertility if untreated.
- Untreated gonorrhea can cause PID in women and epididymitis in men, leading to infertility. In infants, untreated gonorrhea can cause blindness.
- Pelvic inflammatory disease (PID), usually a complication of untreated gonorrhea or chlamydia, is an infection of the uterus and oviducts that may extend to the ovaries and pelvic cavity. It can lead to infertility, ectopic pregnancy, and chronic pelvic pain.
- Human papillomavirus (HPV) causes genital warts and cervical cancer. The virus can be transmitted by asymptomatic people. Even after treatment, a person may continue to carry the virus in healthy-looking tissue. The immune system often clears HPV on its own.
- Genital herpes is a common viral infection that can cause painful blisters on the genitals. The virus remains in the body for life and causes recurrent outbreaks.

- Hepatitis B is an inflammation of the liver caused by one of the many types of hepatitis viruses. It is transmitted through both sexual and nonsexual contact. Following an initial infection, most people recover, but some become carriers and may develop serious complications.

- Syphilis is a highly contagious bacterial infection that can be treated with antibiotics. The disease progresses through three stages. If left untreated, it can lead to deterioration of the central nervous system and death.

- Other diseases that can be transmitted sexually or are linked to sexual activity include trichomoniasis, bacterial vaginosis, lymphogranuloma venereum (LGV), pubic lice, and scabies. Any STD that causes sores or inflammation can increase the risk of HIV transmission.

- Individuals can contribute to a reduction in the incidence of STDs by educating themselves, being diagnosed and treated for any infections, and practicing preventive strategies.

FOR MORE INFORMATION

BOOKS

Grimes, J. 2008. *Seductive Delusions: How Everyday People Catch STDs*. Baltimore, MD: The Johns Hopkins University Press. *This very readable book debunks the widespread "it can't happen to me" attitude with real-life stories about young people who became infected with STDs.*

Hyde, J. S., and J. D. DeLamater. 2010. *Understanding Human Sexuality*, 11th ed. New York: McGraw-Hill. *A comprehensive, multidisciplinary introduction to human sexuality; includes material on STDs.*

Marr, L. 2007. *Sexually Transmitted Diseases: A Physician Tells You What You Need to Know*. Baltimore, MD: Johns Hopkins University Press. *Practical, up-to-date information on the diagnosis, treatment, and prevention of sexually transmitted diseases of all types.*

Pepin, J. 2011. *The Origin of AIDS*. Cambridge, UK: Cambridge University Press. *A highly readable investigation into the perplexing evolutionary origin and early epidemiology of the AIDS virus.*

Shilts, R. 2007. *And the Band Played On: Politics, People, and the AIDS Epidemic*. 20th Anniversary Edition. New York: St. Martin's Griffin. *Originally published in 1987, this landmark book chronicles the early years of the AIDS epidemic, tracing the political, medical, and social forces that facilitated the spread of the epidemic.*

ORGANIZATIONS, HOTLINES, AND WEBSITES

American College Health Association. Offers free brochures on STDs, alcohol use, acquaintance rape, and other health issues.

<http://www.acha.org>

American Social Health Association (ASHA). Provides written information and referrals for STDs; sponsors support groups for people with herpes and HPV.

<http://www.ashastd.org>

Black AIDS Institute. Provides public health information about a variety of topics including testing, treatment, vaccines, and health care access; focuses on black people and the black community.

<http://www.blackaids.org>

The Body: The Complete HIV/AIDS Resource. Provides information about prevention, testing, and treatment and includes an online risk assessment.

<http://www.thebody.com>

CDC National Prevention Information Network. Provides extensive information and links for HIV/AIDS and other STDs.

<http://www.cdcnpi.org>

CDC National STD and AIDS Hotlines. Callers can obtain information, counseling, and referrals for testing and treatment. The hotlines offer information on more than 20 STDs and include Spanish and TTY service.

800-342-AIDS or 800-227-8922; 800-344-SIDA (Spanish)

800-243-7889 (TTY, deaf access)

HIV InSite: Gateway to AIDS Knowledge. Provides information about prevention, education, treatment, statistics, clinical trials, and new developments; from the University of California, San Francisco.

<http://hivinsite.ucsf.edu>

Joint United Nations Programme on HIV/AIDS (UNAIDS). Provides statistics and information on the international HIV/AIDS situation.

<http://www.unaids.org>

MedlinePlus: Sexually Transmitted Diseases. Maintained by the CDC; a clearinghouse of links and information on STDs.

<http://www.nlm.nih.gov/medlineplus/sexuallytransmitteddiseases.html>

The NAMES Project Foundation AIDS Memorial Quilt. Includes the story behind the quilt, images of quilt panels, and information and links relating to HIV infection.

<http://www.aidsquilt.org>

Planned Parenthood Federation of America. Provides information about STDs, family planning, and contraception.

<http://www.plannedparenthood.org>

WHO: Sexually Transmitted Infections. Provides information on international statistics and prevention efforts.

http://www.who.int/topics/sexually_transmitted_infections/en

See also the listings for Chapters 6 and 17.

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BEHAVIOR CHANGE STRATEGY

Talking about Condoms and Safer Sex

The time to talk about safer sex is before you begin a sexual relationship. But even if you've been having unprotected sex with your partner, you can still start practicing safer sex now.

There are many ways to bring up the subject of safer sex and condom use with your partner. Be honest about your concerns and stress that protection against STDs means that you care about yourself and your partner. You may find that your partner shares your concerns and also wants to use condoms. He or she may be happy and relieved that you have brought up the subject of safer sex.

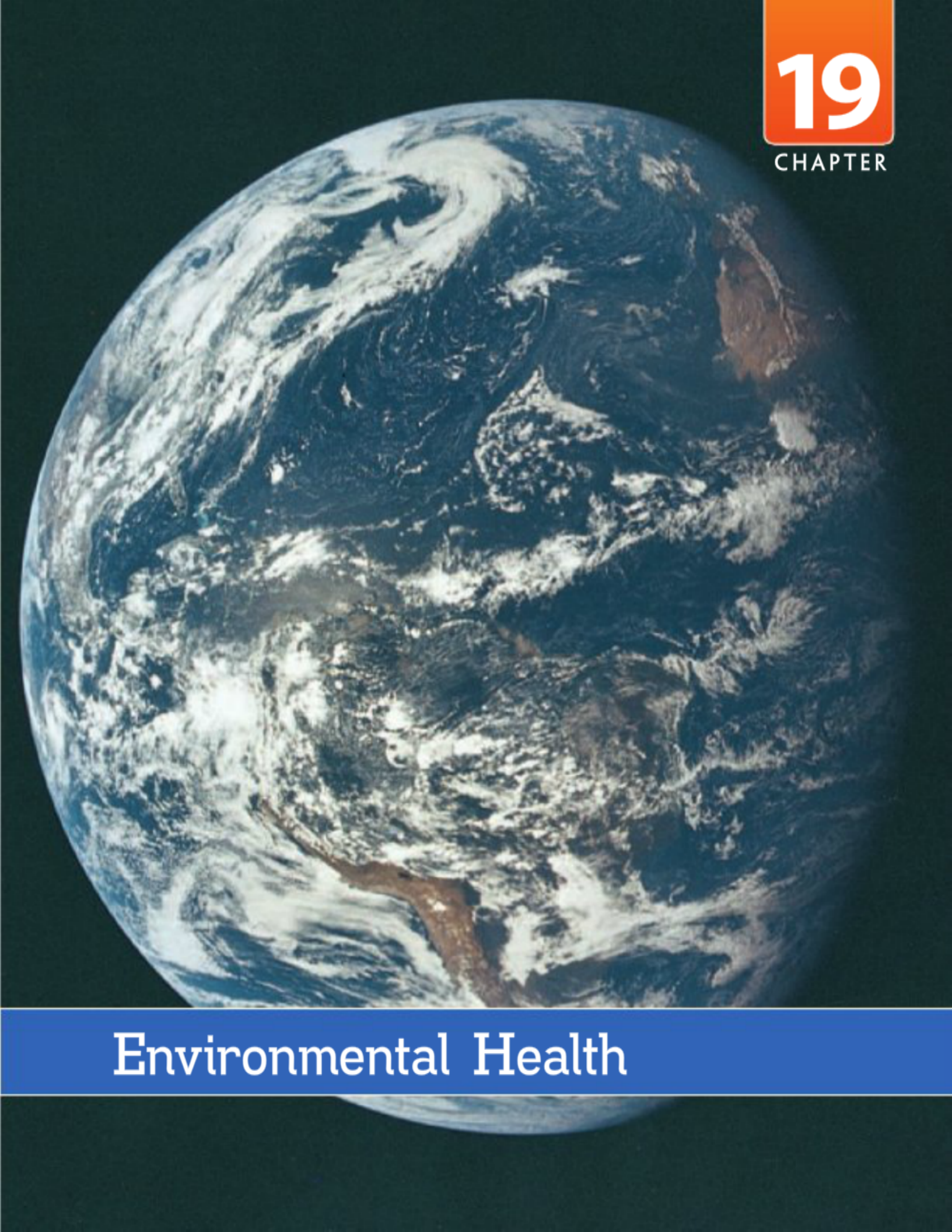
However, if he or she resists the idea of using condoms, you may need to negotiate (see the dialogue suggestions). Stress that you both deserve to be protected and that sex will be more enjoyable when you aren't worrying about STDs. If you and your partner haven't used condoms before, buy some and familiarize yourselves with how to use them. Once you feel more comfortable handling condoms, you'll be able to use them correctly and incorporate them into your sexual activity. Consider trying the female condom as well.

If your partner still won't agree to use condoms, think carefully about whether you want to have a sexual relationship with this person. Maybe he or she is not the right partner for you.

IF YOUR PARTNER SAYS . . .	TRY SAYING . . .
"They're not romantic."	"Worrying about AIDS isn't romantic, and with condoms we won't have to worry." OR "If we put one on together, a condom could be fun."
"You don't trust me."	"I do trust you, but how can I trust your former partners or mine?" OR "It's important to me that we're both protected."
"I don't have any diseases. I've been tested."	"I'm glad you've been tested, but tests aren't foolproof for all diseases. To be safe, I always use condoms."
"I forgot to bring a condom. But it's OK to skip it just this once."	"I'd really like to make love with you, but I never have sex without a condom. Let's go get some."
"I don't like the way they feel."	"They might feel different, but let's try." OR "Sex won't feel good if we're worrying about diseases." OR "How about trying the female condom?"
"I don't use condoms."	"I use condoms every time." OR "I don't have sex without condoms."
"But I love you."	"Being in love can't protect us from diseases." OR "I love you, too. We still need to use condoms."
"But we've been having sex without condoms."	"I want to start using condoms now so we won't be at any more risk." OR "We can still prevent infection or reinfection."

SOURCE: Dialogue from San Francisco AIDS Foundation. 1998. *Condoms for Couples*. Reprinted with permission.

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Environmental Health

LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain how population growth affects the earth's environment and contributes to pollution and climate change
- Discuss the causes and effects of air and water pollution, and describe strategies that people can take to protect these resources
- Discuss the issue of solid waste disposal and the impact it has on the environment and human health
- Identify some key sources of chemical and radiation pollution, and discuss methods for preventing such pollution
- Explain how energy use affects the environment, and describe steps everyone can take to use energy more efficiently

TEST YOUR KNOWLEDGE

1. The world's current population is about what?
 - a. 6 billion
 - b. 7 billion
 - c. 700 billion
2. Air pollution can be naturally occurring, as well as human-made. True or false?
3. Worldwide, how many people do not have consistent access to safe drinking water?
 - a. 11 million
 - b. 110 million
 - c. 1.1 billion
4. Light-emitting diode (LED) bulbs can last 40 times longer than standard incandescent lightbulbs. True or false?

ANSWERS

1. **B.** The world's current population is about 7 billion and is expected to reach 9.3 billion people by 2050, according to the United Nations Population Division.
2. **TRUE.** There are many types of naturally occurring air pollution, such as smoke from forest fires and dust from dust storms.
3. **C.** According to the World Health Organization, over 1.1 billion people worldwide do not have reliable access to clean drinking water. About 2.6 billion do not have access to basic sanitation.
4. **TRUE.** LED bulbs use 10% as much energy as and last up to 42 times longer than regular lightbulbs.

We are constantly reminded of our intimate relationship with everything that surrounds us—our **environment**. Although the planet provides us with food, water, air, and everything else that sustains life, it also provides us with natural occurrences—earthquakes, tsunamis, hurricanes, drought, climate changes—that destroy life and disrupt society. In the past, humans frequently had to struggle against the environment to survive. Today, in addition to dealing with natural disasters, we also have to find ways to protect the environment from the by-products of our way of life.

This chapter introduces the concept of environmental health and explains how the environment affects us. The chapter also discusses the ways humans affect the planet and its resources, and describes steps you can take to improve your personal environmental health while reducing your impact on the earth.

ENVIRONMENTAL HEALTH DEFINED

The field of **environmental health** grew out of efforts to control communicable diseases. When certain insects and rodents were found to carry microorganisms that cause disease in humans, campaigns were undertaken to eradicate or control these animal vectors. It was also recognized that pathogens could be transmitted in sewage, drinking water, and food. These discoveries led to systematic garbage collection, sewage treatment, filtration and chlorination of drinking water, food inspection, and the establishment of public health enforcement agencies.

These efforts to control and prevent communicable diseases changed the health profile of the developed world. Americans rarely contract cholera, typhoid fever, plague, diphtheria, or other diseases that once killed large numbers of people; but these diseases have not been eradicated worldwide.



Natural events—such as the flooding that occurred in Queensland in 2012—can directly kill thousands of people while wiping out essential services, polluting water, and facilitating the spread of disease.

In the United States a huge, complex public health system is constantly at work behind the scenes attending to the details of these critical health concerns. Every time the system is disrupted, danger recurs. After any disaster that damages a community's public health system—whether a natural disaster such as a hurricane or a human-made disaster such as a terrorist attack—prompt restoration of basic health services becomes crucial to human survival. Every time we venture beyond the boundaries of our everyday world, whether traveling to a less developed country or camping in a wilderness area, we are reminded of the importance of these basics: clean water, sanitary waste disposal, safe food, and insect and rodent control.

Over the last few decades, the focus of environmental health has expanded and become more complex, for several reasons. We now recognize that environmental pollutants

contribute not only to infectious diseases but to many chronic diseases as well. In addition, technological advances have increased our ability to affect and damage the environment. Also, rapid population growth, which has resulted partly from past environmental improvements, means that far more people are consuming and competing for resources than ever before, magnifying the effect of humans on the environment.

Environmental health encompasses all the interactions of humans with their environment and the health consequences of these interactions. Fundamental to this definition is a recognition that we hold the world in trust for future generations and for other forms of life. Our responsibility is to pass on a world no worse, and preferably better, than the one we

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How often do you think about the environment's impact on your personal health? In what ways do your immediate surroundings (your home, neighborhood, school, workplace) affect your well-being? In what ways do you influence the health of your personal environment?

environment The natural and human-made surroundings in which we spend our lives.

environmental health The collective interactions of humans with the environment and the short-term and long-term health consequences of those interactions.

TERMS

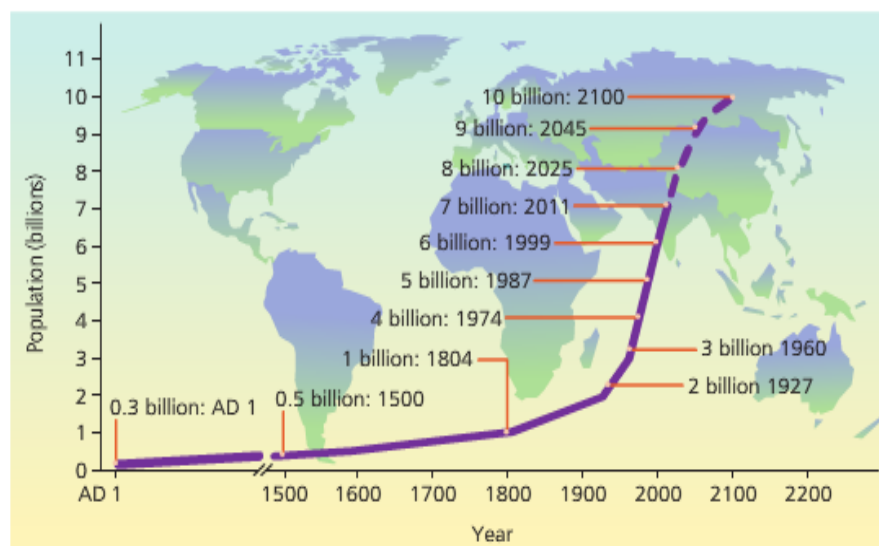


FIGURE 19.1 World population growth. The United Nations estimates that the world's population will continue to increase dramatically until it stabilizes above 10 billion people in 2100.

SOURCES: United Nations Population Division. 2011. *World Population Prospects: The 2010 Revision*. (<http://esa.un.org/unpd/wpp/>) New York: United Nations; U.S. Bureau of the Census.



ASSESS YOURSELF

Environmental Health Checklist

The following list of statements relates to your effect on the environment. Put a checkmark next to the statements that are true for you:

- ☐ I ride my bike, walk, carpool, or use public transportation whenever possible.
- ☐ I keep my car tuned up and well maintained.
- ☐ My residence is well insulated.
- ☐ Where possible, I use LEDs or compact fluorescent bulbs instead of incandescent bulbs.
- ☐ I turn off lights and appliances when they are not in use.
- ☐ I avoid turning on heat or air conditioning whenever possible.
- ☐ I run the washing machine, dryer, and dishwasher only when they have full loads.
- ☐ I run the clothes dryer only as long as it takes my clothes to dry.
- ☐ I dry my hair with a towel rather than a hair dryer.
- ☐ I keep my car's air conditioner in good working order and have it serviced by a service station that recycles CFCs.
- ☐ When shopping, I choose products with the least amount of packaging.
- ☐ I choose recycled and recyclable products.
- ☐ I avoid products packaged in plastic and unrecycled aluminum.
- ☐ I store food in glass jars and waxed paper rather than plastic wrap.
- ☐ I take my own bag along when I go shopping.
- ☐ I recycle newspapers, glass, cans, and other recyclables.
- ☐ When shopping, I read labels and try to buy the least toxic products available.
- ☐ I dispose of household hazardous wastes properly.
- ☐ I take showers instead of baths.
- ☐ I take short showers and switch off the water when I'm not actively using it.
- ☐ I do not run the water while brushing my teeth, shaving, or hand-washing clothes.
- ☐ My faucets have aerators installed in them.
- ☐ My shower has a low-flow showerhead.
- ☐ I have a water-saving toilet or a water displacement device in my toilet.
- ☐ I snip or rip plastic six-pack rings before I throw them out.
- ☐ When hiking or camping, I never leave anything behind.

Statements you have not checked can help you identify behaviors you can change to improve environmental health.

For an estimate of how much land and water your lifestyle requires, take the Ecological Footprint quiz at www.myfootprint.org. You can also determine your "carbon footprint" at the Global Footprint Network website (www.footprintnetwork.org/en/index.php/GFN/page/calculators) or at the Nature Conservancy website (www.nature.org/initiatives/climatechange/calculator/?src=112).

live in today. Although many environmental problems are complex and seem beyond the control of the individual, there are ways that people can make a difference to the future of the planet (see the box "Environmental Health Checklist").

POPULATION GROWTH AND CONTROL

Throughout most of history, humans have been a minor pressure on the planet. About 300 million people were alive in the year AD 1; by the time Europeans were settling in the United

States 1600 years later, the world population had increased gradually to a little over 500 million. But then it began rising exponentially—zooming to 1 billion by about 1800, more than doubling by 1930, and then doubling again in just 40 years (Figure 19.1).

The world's human population, currently over 7 billion, is increasing at a rate of about 75 million per year—approximately 150 people every minute. The United Nations projects that world population will reach 9.3 billion by 2050 and will continue to increase until it levels off above 10.1 billion in 2100.

Virtually all of this increase is taking place in less developed regions. In 1950 the more developed regions accounted

for 32% of the world's population; their share dropped to 20% in 2000 and is expected to further decline to 13% in 2050. Changes are also projected for the world's age distribution: the proportion of people aged 60 and over will increase from 10% in 2000 to 22% in 2050, and by 2050 there will be more older people than children.

This rapid expansion of population, particularly in the past 50 years, is generally believed to be responsible for most of the stress humans put on the environment. A large and rapidly growing population makes it more difficult to provide the basic components of environmental health, including clean and disease-free food and water. It is also a driving force behind many of the relatively more recent environmental health concerns, including chemical pollution, global climate change, and the thinning of the atmosphere's ozone layer.

How Many People Can the World Hold?

No one knows how many people the world can support, but most scientists agree that there is a limit. A 2011 report from the United Nation's Convention on Biological Diversity states that the population's demand for resources already exceeds the earth's capacity by 20%. The primary factors that may eventually put a cap on human population are the following:

- **Food:** Enough food is currently produced to feed the world's entire population, but economic and sociopolitical factors have led to food shortages and famine. Food production can be expanded in the future, but better distribution of food will be needed to prevent even more widespread famine as the world's population keeps growing. For all people to receive adequate nutrition, the makeup of the world's diet may also need to change.

- **Available land and water:** Rural populations rely on trees, soil, and water for their direct sustenance, and a growing population puts a strain on these resources. Forests are cut for wood, soil is depleted, and water is withdrawn at ever-increasing rates. These trends contribute to local hardships and to many global environmental problems, including habitat destruction and species extinction.

- **Energy:** Currently most of the world's energy comes from nonrenewable sources: oil, coal, natural gas, and nuclear power. As these sources are depleted, the world will have to shift to renewable (*sustainable*) energy sources, such as hydropower and solar, geothermal, wind, biomass, and ocean power. Supporting a growing population, maintaining economic productivity, and stemming environmental degradation will

require both greater energy efficiency and an increased use of renewable energy sources.

- **Minimum acceptable standard of living:** The mass media have exposed the entire world to the American lifestyle and raised people's expectations of living at a comparable level. But such a lifestyle is supported by levels of energy consumption that the earth cannot support indefinitely. The United States has about 5% of the world's population but uses 25% of the world's energy. In contrast, India has 16% of the world's population but uses only 3% of its energy. China's energy consumption is rapidly increasing, and that nation accounts for 20% of the world's population. If *all* people are to enjoy a minimally acceptable standard of living, the population must be limited to a number that available resources can support.

QUICK STATS

By 2050 the U.S. population will exceed 423 million; its current population is 313.5 million.

—U.S. Census Bureau, 2011

Factors That Contribute to Population Growth

Although it is apparent that population growth must be controlled, population trends are difficult to influence and manage. A variety of interconnecting factors fuel the current population explosion:

- **High fertility rates:** The combination of poverty, high child mortality rates, and a lack of social provisions of every type is associated with high fertility rates in the developing world. Families may need to have more children to ensure that enough survive childhood to work for the household and to care for parents in old age. Most countries, both developed and developing, have experienced significant reductions in fertility as contraceptive use has increased. However, the majority of developing countries still have fertility levels that ensure substantial population growth. In a small number of countries, most of which are classified as least developed, fertility levels continue to be very high.

- **Lack of family planning resources:** Half the world's couples don't use any form of family planning.

The United States has about 5% of the world's population but uses 25% of the world's energy.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What is the population of your town or city? Does the sheer number of people in your town make living there difficult, or more enjoyable? In what ways? Do you believe your town has adequate infrastructure and resources to support its residents?

- **Lower death rates:** Although death rates remain relatively high in the developing world, they have decreased in recent years because of public health measures and improved medical care.

Changes in any of these factors can affect population growth, but the issues are complex. Increasing death rates through disease, famine, or war might slow population growth, but few people would argue in favor of these as methods of population control. Although the increased availability of family planning services is a crucial part of population management, cultural, political, and religious factors also need to be considered.

To be successful, population management policies must change the condition of people's lives, especially poverty, to remove the pressures to have large families. Research indicates that the combination of improved health, better education, and increased literacy and employment opportunities for women works together with family planning to decrease fertility rates. Unfortunately, in the fastest-growing countries, the needs of a rapidly increasing population use up financial resources that might otherwise be used to improve lives and ultimately slow population growth.

AIR QUALITY AND POLLUTION

Air pollution is not a human invention or even a new problem. The air is polluted naturally with every forest fire, pollen bloom, and dust storm, as well as with countless other natural pollutants. To these natural sources, humans have always contributed the by-products of our activities.

Air pollution is linked to a wide range of health problems, and the very young and the elderly are among the most susceptible to air pollution's effects. For people with chronic ailments such as diabetes or heart failure, even relatively brief exposures to particulate air pollution increases the risk of death by nearly 40%. Recent studies have linked exposure to air pollution to reduced birth weight in infants, reduced lung capacity in teens, and atherosclerosis (thickening of the arteries) in adults.

Air Quality Index (AQI) A measure of local air quality and what it means for health.

TERMS

fossil fuels Buried deposits of decayed animals and plants that are converted into carbon-rich fuels by exposure to heat and pressure over millions of years; oil, coal, and natural gas are fossil fuels.

Air Quality and Smog

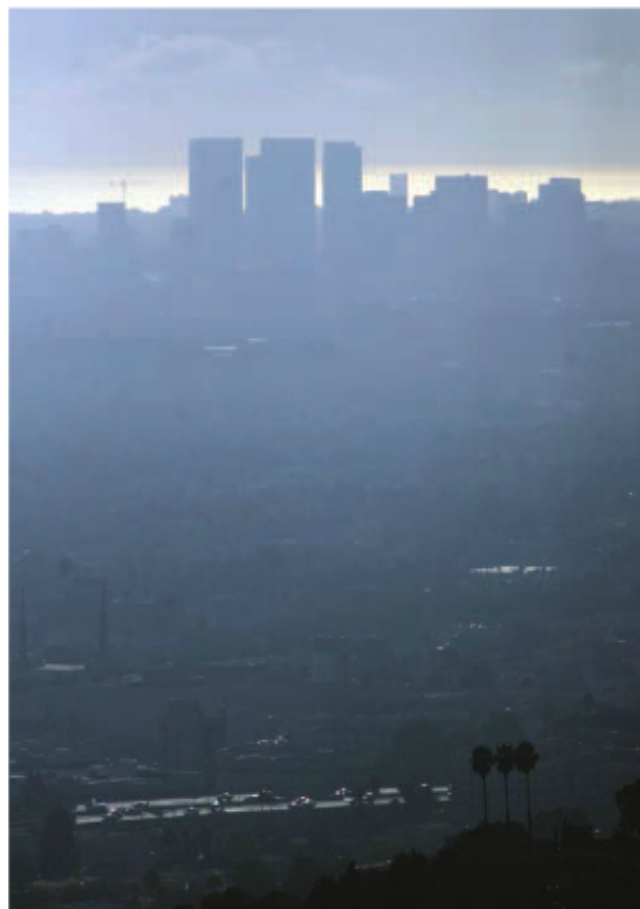
The U.S. Environmental Protection Agency (EPA) uses a measure called the **Air Quality Index (AQI)** to indicate whether air pollution levels pose a health concern. The AQI is used for five major air pollutants:

- **Carbon monoxide (CO):** An odorless, colorless gas, CO forms when the carbon in **fossil fuels** does not completely burn. The primary sources of CO are vehicle exhaust and fuel combustion in industrial processes. CO deprives body cells of oxygen, causing headaches, fatigue, and impaired vision and judgment. It also aggravates cardiovascular diseases.

- **Sulfur dioxide (SO₂):** SO₂ is produced by the burning of sulfur-containing fuels such as coal and oil, during metal smelting, and by other industrial processes; power plants are a major source. In humans, SO₂ narrows the airways, which may cause wheezing, chest tightness, and shortness of breath, particularly in people with asthma. SO₂ may also aggravate symptoms of CVD.

QUICK STATS
127 million
Americans (41% of the nation) live in counties where the air is unhealthy at least some of the time.

—American Lung Association
State of the Air 2012



Smog tends to form over Los Angeles because of the natural geographical features of the area and because of the tremendous amount of motor vehicle exhaust in the air.

- **Nitrogen dioxide (NO₂):** NO₂ is a reddish-brown, highly reactive gas formed when nitric oxide combines with oxygen in the atmosphere; major sources include motor vehicles and power plants. In people with respiratory diseases such as asthma, NO₂ affects lung function and causes symptoms such as wheezing and shortness of breath. NO₂ exposure may also increase the risk of respiratory infections.

- **Particulate matter (PM):** Particles of different sizes are released into the atmosphere from a variety of sources, including combustion of fossil fuels, crushing or grinding operations, industrial processes, and dust from roadways. PM can accumulate in the respiratory system, aggravate cardiovascular and lung diseases, and increase the risk of respiratory infections.

- **Ground-level ozone:** At ground level, ozone is a harmful pollutant. Where it occurs naturally in the upper atmosphere, it shields the earth from the sun's harmful ultraviolet rays. (The health hazards from the thinning of this protective ozone layer are discussed later in the chapter.) Ground-level ozone is formed when pollutants emitted by cars, power plants, industrial plants, and other sources react chemically in the presence of sunlight (photochemical reactions). Ozone can irritate the respiratory system, reduce lung function, aggravate asthma, increase susceptibility to respiratory infections, and damage the lining of the lungs. Short-term elevations of ozone levels have also been linked to increased death rates.

AQI values run from 0 to 500; the higher the AQI, the greater the level of pollution and associated health danger. When the AQI exceeds 100, air quality is considered unhealthy, at first for certain sensitive groups of people and then for everyone as AQI values rise. For local areas, AQI values are calculated for each of the five pollutants just listed, and the highest value becomes the AQI rating for that day. Depending on the AQI value, local officials may issue precautionary health advice. Local AQI information is often available in newspapers, on television and radio, on the Internet, and from state and local telephone hotlines.

The term **smog** was first used in the early 1900s in London to describe the combination of smoke and fog. What we typically call *smog* today is a mixture of pollutants, with ground-level ozone being the key ingredient. Major smog occurrences are linked to the combination of several factors: heavy motor vehicle traffic, high temperatures, and sunny weather can increase the production of ozone. Pollutants are also more likely to build up in areas with little wind and/or where a topographic feature such as a mountain range or valley prevents the wind from pushing out stagnant air.

The Greenhouse Effect and Global Warming

The temperature of the earth's atmosphere depends on the balance between the amount of energy the planet absorbs from the sun (mainly as high-energy ultraviolet radiation) and the amount of energy radiated back into space as lower-

Table 19.1

Sources of Greenhouse Gases

GREENHOUSE GAS	SOURCES
Carbon dioxide	Fossil fuel and wood burning, factory emissions, car exhaust, deforestation
Chlorofluorocarbons (CFCs)	Refrigeration and air conditioning, aerosols, foam products, solvents
Methane	Cattle, wetlands, rice paddies, landfills, gas leaks, coal and gas industries
Nitrous oxide	Fertilizers, soil cultivation, deforestation, animal feedlots and wastes
Ozone and other trace gases	Photochemical reactions, car exhaust, power plant emissions, solvents

energy infrared radiation. Key components of temperature regulation are carbon dioxide, water vapor, methane, and other **greenhouse gases**—so named because, like the glass panes in a greenhouse, they let through visible light from the sun but trap some of the resulting infrared radiation and re-radiate it back to the earth's surface. This reradiation causes a buildup of heat that raises the temperature of the lower atmosphere, a natural process known as the **greenhouse effect**. (See page T1-5 of the color transparency insert "Touring Lifestyle Behaviors" in Chapter 10.) Without it, earth's atmosphere would be far cooler and much more hostile to life.

There is growing consensus that human activity is causing **global warming** or *climate change*. The concentration of greenhouse gases is increasing because of human activity, especially the combustion of fossil fuels (Table 19.1). Carbon dioxide levels in the atmosphere have increased rapidly in recent decades and currently stand at 396.18 parts per million. Many scientists and climate experts say that 350 parts per million is the target number for the safe upper limit of carbon concentration in our atmosphere. The use of fossil fuels pumps more than 20 billion tons of carbon dioxide into the atmosphere every year. Experts believe carbon dioxide may account for about 60% of the greenhouse effect. Analysis of ice core samples shows that carbon dioxide levels are now

smog Hazy atmospheric conditions resulting from increased concentrations of ground-level ozone and other pollutants.

TERMS

greenhouse gas A gas (such as carbon dioxide) or vapor that traps infrared radiation instead of allowing it to escape through the atmosphere, resulting in a warming of the earth (the *greenhouse effect*).

greenhouse effect A warming of the earth due to a buildup of greenhouse gases in the atmosphere.

global warming An increase in the earth's atmospheric temperature when averaged across seasons and geographical regions; also called *climate change*.

about 30% higher than atmospheric levels for at least 800,000 years before the Industrial Revolution. The United States is responsible for one-third of the world's total emissions of carbon dioxide. Deforestation, often by burning, also sends carbon dioxide into the atmosphere and reduces the number of trees available to convert carbon dioxide into oxygen.

The 12-month period between May 2011 and April 2012 was the warmest period on record since record keeping began in 1895, and the 10 warmest periods have all occurred since June 1999. The average global temperature has risen more than 1 degree Fahrenheit since 1895. There is growing agreement among scientists that temperatures will continue to rise, although estimates vary as to how much they will change. If global warming persists, experts say the impact may be devastating. Possible consequences include the following:

- Increased rainfall and flooding in some regions, and increased drought in others. Coastal zones, where half the world's people live, would be severely affected.
- Increased mortality from heat stress, urban air pollution, and tropical diseases. Deaths from extreme weather events such as hurricanes, tornadoes, droughts, and floods might also increase.
- A poleward shift of about 50–350 miles (150–550 km) in the location of vegetation zones, affecting crop yields, irrigation demands, and forest productivity.
- Increasingly rapid and drastic melting of the earth's polar ice caps. Arctic ice melts to some extent during the summer each year, but during the 2007 melting season, Arctic ice formations melted faster and farther than at any other time since observations began. Many decades earlier than originally predicted by the last Intergovernmental Panel on

Climate Change (IPCC), the Arctic sea ice could melt away completely during the summer as soon as 2030, though it would return in the winter months. Such extensive melting could mean increased flooding in the Northern Hemisphere, further changes in weather patterns, and the elimination of habitat for species that live in the Arctic.

According to estimates from the Environmental Protection Agency (EPA), the earth's average surface temperature is likely to increase 2.0–11.5°F (1.1–6.4°C) by the end of the 21st century (Figure 19.2). Warming will not be evenly distributed around the globe. Land areas will warm more than oceans in part due to water's ability to store heat. High latitudes will warm more than low ones in part due to the effects of melting ice. Most of North America, all of Africa, Europe, Northern and Central Asia, and most of Central and South America are likely to warm more than the global average.

Parties at the 2011 United Nations Climate Change Conference in Durban, South Africa, endorsed the scientific view that keeping the increase in global temperature below 2 degrees Celsius is necessary to stave off the worst effects of climate change. The Durban Platform set the terms for a legally binding treaty to be defined by 2015 and becoming effective by 2020. A conflict of interest divides the developed countries of the world from the developing countries when it comes to reducing greenhouse gas emissions to control global warming.

Increasing research on climate change has revealed that significant amounts of greenhouse gases come from sources other than industrial ones. The United Nations has reported, for example, that raising cattle produces more greenhouse gases than driving cars. So far, agriculture has not been included in global climate change agreements.

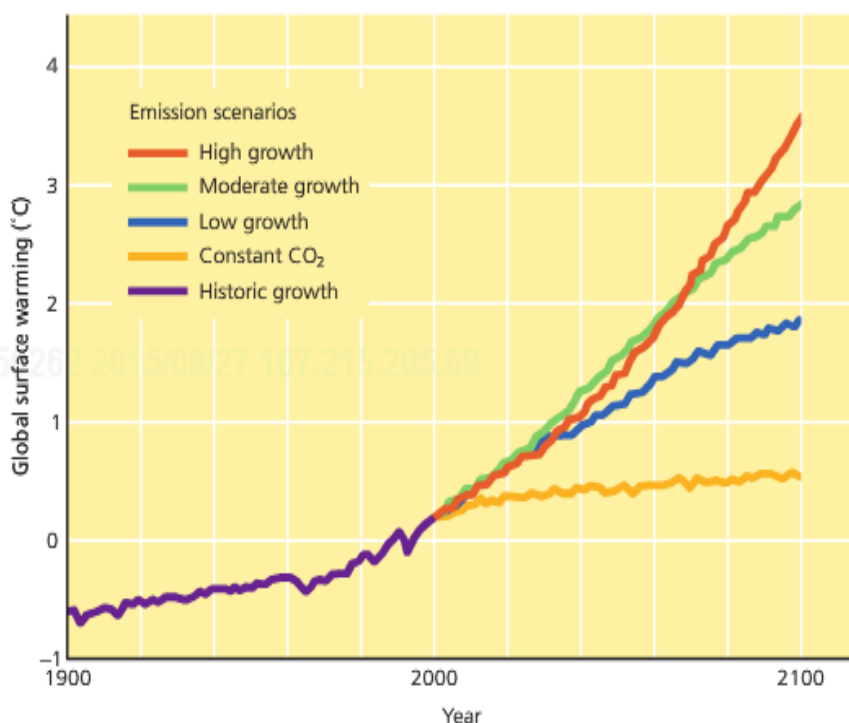


FIGURE 19.2 Temperature projections to the year 2100, based on different greenhouse gas growth scenarios. The gold line shows that temperatures would change only slightly if greenhouse gas emissions stopped rising.

SOURCE: Environmental Protection Agency, 2007. *Future Temperature Changes* (<http://www.epa.gov/climatechange/science/futuretc.html>).

Thinning of the Ozone Layer

Another air pollution problem is the thinning of the **ozone layer** of the atmosphere, a fragile, invisible layer about 10–30 miles above the earth's surface that shields the planet from the sun's hazardous ultraviolet (UV) rays. Since the mid-1980s scientists have observed the seasonal appearance and growth of a hole in the ozone layer over Antarctica. More recently thinning over other areas has been noted.

The ozone layer is being destroyed primarily by **chlorofluorocarbons (CFCs)**, which are industrial chemicals used as coolants in refrigerators and air conditioners, as foaming agents in some rigid foam products, as propellants in some kinds of aerosol sprays (most of which were banned in 1978), and as solvents. When CFCs rise into the atmosphere, winds carry them toward the polar regions. During winter, circular winds form a vortex that keeps the air over Antarctica from mixing with air from elsewhere. CFCs react with airborne ice crystals, releasing chlorine atoms, which destroy ozone. When the polar vortex weakens in the summer, winds richer in ozone from the north replenish the lost Antarctic ozone.

In the Northern Hemisphere, ozone levels have declined by about 10% since 1980, and certain areas may be temporarily depleted in late winter and early spring by as much as 40%. The largest and deepest ozone hole on record occurred in late September 2006, reaching 10.6 million square miles, considerably larger than the surface area of North America. The hole also had an unusual vertical extent, with nearly all the ozone between 8 and 13 miles above the earth's surface destroyed.

Without the ozone layer to absorb the sun's UV radiation, life on earth would be impossible. (UV radiation levels under the Antarctic hole were high enough to cause sunburn within seven minutes.) The potential effects of increased long-term exposure to UV light for humans include skin cancer, wrinkling and aging of the skin, cataracts and blindness, and reduced immune response. The United Nations Environment Programme predicts that a drop of 10% in overall ozone levels would cause a 26% rise in the incidence of nonmelanoma skin cancers. Some scientists already blame ozone loss for many cases of melanoma.

UV light may interfere with photosynthesis and cause lower crop yields; it may also kill phytoplankton and krill—the basis of the ocean food chain. And because heat generated by the absorption of UV rays in the ozone layer helps create

stratospheric winds, the driving force behind weather patterns, a drop in the concentration of ozone could potentially alter the earth's climate systems.

Worldwide production and use of CFCs have declined rapidly since the danger to the ozone layer was recognized.

Industrialized nations agreed to eliminate CFC production as of the year 2000, and limits have also been placed on other agents that destroy ozone. Ozone-depleting substances have very long lifetimes in the atmosphere, however, so despite these efforts, the ozone hole is not expected to disappear until 2070. This gradual recovery is masked by annual variations caused by weather fluctuations over Antarctica.

Without the ozone layer to absorb the sun's UV radiation, life on earth would be impossible.

Energy Use and Air Pollution

Americans are the biggest energy consumers in the world (Table 19.2). We use energy to create electricity, transport us, power our industries, and run our homes. About 83% of the energy we use comes from fossil fuels—oil, coal, and natural gas. The remainder comes from nuclear power and renewable energy sources (such as hydroelectric, wind, and solar power).

Table 19.2

Primary Energy Consumption of Selected Countries

COUNTRY	TOTAL CONSUMPTION 2007 (QUADRILLION BTU*)	TOTAL CONSUMPTION 2009 (QUADRILLION BTU*)
United States	101.554	94.547 ↓↓
China	73.219	90.258 ↑↑
Russia	28.355	26.816 ↓
India	17.255	21.689 ↑↑
Japan	22.473	20.598 ↓
Germany	14.166	13.461 ↓
France	11.206	10.658 ↓
South Korea	9.647	9.959 ↑
United Kingdom	9.460	8.906 ↓
Spain	6.667	6.076 ↓
Australia	6.124	5.590 ↓
South Africa	5.344	5.469 ↑
Taiwan	3.945	4.491 ↑
Thailand	3.532	3.997 ↑
Total	312.947	322.515
World Total	492.6	503.8

*Includes total consumption of petroleum, dry natural gas, and coal, and net hydroelectric, nuclear, geothermal, solar, wind, and wood and waste electricity; also includes net electricity imports.

SOURCE: Energy Information Administration. 2011. *International Energy Statistics: Total Primary Energy Consumption (Quadrillion BTU): All Countries, 2009* (<http://tonto.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm>).

ozone layer A layer of ozone molecules (O_3) in the upper atmosphere that screens out UV rays from the sun.

chlorofluorocarbons (CFCs) Chemicals used as spray can propellants, refrigerants, and industrial solvents, which have been implicated in the destruction of the ozone layer.

TERMS



Wind power, generated from turbines, is a clean and renewable source of energy.

Energy consumption is at the root of many environmental problems, especially those relating to air pollution. Automobile exhaust and the burning of oil and coal by industry and by electric power plants are primary causes of smog, acid precipitation, and the greenhouse effect. The mining of coal and the extraction and transportation of oil cause pollution on land and in the water; the 2010 oil spill in the Gulf of Mexico was the worst environmental disaster in American history and one of the largest oil spills ever to occur. Nuclear power generation creates hazardous wastes and carries the risk of dangerous releases of radiation.

Despite increases in U.S. consumer gas prices, more than 70% of commuters drive alone to work, and low-fuel-economy sport utility vehicles (SUVs) remain popular. Every gallon of gas burned puts about 20 pounds of carbon dioxide into the atmosphere. Some SUVs average fewer than 10 miles per gallon, and the largest SUVs increase greenhouse gas emissions by 6 or more tons per year more than an average car.

Environmental Threats of Extreme Energy Sources

As the worldwide demand for energy rises and supplies of easily accessible oil dwindle, some energy companies have turned to what are often called “extreme energy sources.” This term describes fossil fuels that are relatively difficult to access and extract from the environment. Examples include deepwater oil rigs, tar sands oil extraction, and hydrofracking of natural gas. Accessing these energy sources requires new technologies and practices. Critics worry that

these technologies have been insufficiently studied and regulated and may pose significant new environmental risks.

The Deepwater Horizon oil rig that exploded in April 2011 in the Gulf of Mexico was a deepwater rig. As oil gushed into the waters of the Gulf at an estimated rate of 60,000 barrels a day, it became clear that BP, the company that owned the rig, did not know how to stop it. It took BP three months to plug the leak, after nearly 5 million barrels of oil were released into the Gulf. Chemical dispersants used to break up the oil had possible toxic effects and may have caused much of the oil to remain beneath the surface in large plumes or to settle on the ocean floor, where it cannot be reached for cleanup. The disaster killed thousands of birds, hundreds of endangered sea turtles, and many dolphins and other marine mammals. The Gulf’s ecosystems may need generations to recover fully, and some parts of it may never recover. Researchers have discovered trace amounts of oil in some fish and shellfish, leading to concerns that oil could reach the human food chain.

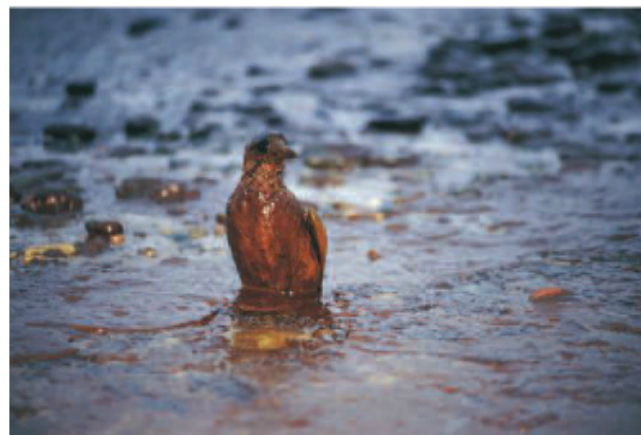
Tar sands (or oil sands) are sand deposits that are saturated with a dense form of petroleum called bitumen. The largest deposits are found in Canada, Kazakhstan, and Russia. Making liquid fuel from the oil in tar sands is a very energy-intensive process. When used as fuel, the re-

sulting molasseslike product produces two to four times the amount of greenhouse gases per barrel compared to other conventional oils. Canada has placed a priority on tar sands development, but critics like NASA climate scientist James Hansen note that these “dirty” deposits contain 240 gigatons of carbon, representing twice the amount of CO₂ emitted by all oil ever used. In addition, Canada’s tar sands oil will need to travel through thousands of miles of leak-prone pipelines across pristine wildlife habitats in both Canada and the United States, and when

QUICK STATS

The United States consumes 18.835 million barrels of petroleum every day.

—U.S. Energy Information Administration, 2011



Oil spills harm wildlife, threaten water supplies, and can damage local economies.

it reaches shipping terminals, huge increases in oil tanker ship traffic will endanger fragile marine habitats in both countries.

Hydraulic fracturing, or “fracking,” uses pressurized mixes of fluids to create cracks in rock formations deep underground, releasing natural gas. New technology and techniques have recently prompted the mining of deposits in the extensive Marcellus Shale formation, which covers large areas of the Northeast. However, critics have raised concerns about the safety of the technique. The specific chemicals used have not been publicly disclosed by energy companies using this technique, and reports of groundwater contamination have been verified by independent third parties. In response to storms of protest, a number of impact studies and legislative reform efforts are now under way.

Renewable Energy With fossil fuels becoming increasingly problematic politically, economically, and environmentally, interest and investment in renewable energy sources have grown in recent years. Renewable energy sources are those sources that are naturally replenished and essentially inexhaustible, such as wind and sunlight. Together with technologies that improve energy efficiency, renewable energy sources contribute to sustainability—the capacity of natural or human systems to endure and maintain well-being over time. A common definition of *sustainable development* is development that meets society’s present needs without compromising the ability of future generations to meet their needs.

Renewable energy sources include wind power, solar power, water and wave power, geothermal power, and biomass and biofuels from renewable sources, among others. Energy efficiency is not a power source, but it affects our energy future and has been called by some “the fifth fuel” after coal, petroleum, nuclear, and alternative energy technologies.

- **Wind power** uses the energy of the wind to turn blades that run a turbine, which spins a generator, which produces electricity.
- **Solar power** uses the heat and light of the sun to produce energy via a variety of technologies. One solar technology is the concentrating solar power (CSP) system, which uses mirrors, dishes, or towers to reflect and collect solar heat to generate steam, which runs a turbine to produce electricity. Another solar technology is the photovoltaic (solar cell) system, which converts sunlight directly into electricity by means of semiconducting materials.
- **Geothermal power** taps the heat in the earth’s core. It may be in the form of hot water or steam, which can be used to run a turbine to produce electricity. In some geologically unstable parts of the planet, including Yellowstone Park and parts of northern California, geothermal energy is close to the surface.
- **Biomass** is plant material, including trees. When biomass is burned, it produces energy. If the plants are produced

and harvested sustainably, they are a renewable source of energy.

- **Biofuels** are fuels based on natural materials—either alcohol or oil. Bioethanol is made primarily from sugar and starch crops like corn, although trees and grasses may be used in the future. Ethanol can be used as a fuel for vehicles or added to gasoline. Biodiesel is made from vegetable oils or animal fats and can be used either in a pure form to power vehicles or added to petroleum-based diesel to reduce carbon emissions.

In 2011 President Obama called for a new energy future, embracing alternative and renewable energy, ending our addiction to foreign oil, and addressing the global climate crisis. The administration’s “Blueprint for a Secure Energy Future” set a goal of generating 80% of the nation’s electricity from “clean energy sources (including natural gas, nuclear, and clean coal)” by 2035, as well as putting 1 million electric vehicles on the road by 2015 and becoming the world’s leader in advanced vehicle technologies.

Worldwide, renewable energy sources were providing one-quarter of power capacity from all sources and 19% of the global electricity supply in 2011. World renewable energy production capacity increased by 56% from 2008 to 2010. Within this period, solar electricity capacity grew by 250%, wind power grew by 64%, and ethanol production grew by 28%. Despite a downturn in 2009, both the United States and Europe added more renewable power capacity than conventional (fossil fuel) capacity. By 2011 more than 118 countries had enacted some type of policy target or promotion policy related to renewable energy. Many of these targets call for 15–25% of energy or electricity to be provided by renewable sources by 2020. The pursuit of renewable energy sources is seen as having the potential to create new industries and generate jobs, in addition to benefiting the environment.

Alternative Fuels The U.S. Department of Energy (DOE) is encouraging researchers and automobile manufacturers to produce vehicles that can handle alternative fuels such as ethanol. Ethanol, a form of alcohol, is a renewable and largely domestic transportation fuel produced from fermenting plant sugars such as corn, sugarcane, and other starchy agricultural products. Ethanol use reduces the amount of imported oil required to produce gasoline, reduces overall greenhouse gas emissions from automobiles, and supports the U.S. agricultural industry.

Another type of alternative fuel is E85, which is a mixture of 85% ethanol and 15% gasoline. E85 is becoming popular in the Midwest region (the “corn belt”) of the United States. E85 provides lower mileage than gasoline, though it typically costs less than regular gasoline. Ethanol has been mixed with gasoline for years in the United States, but several other countries (such as Brazil) use ethanol much more extensively.

Ethanol, however, has its critics, who say the alternative fuel may do more harm than good. For one thing, some reports show that corn-based ethanol requires more energy to produce than it

yields when burned as fuel. Other reports dispute this point, and improvements in manufacturing processes may reduce the amount of energy required to make the fuel. Regardless, ethanol made from sugarcane and other “woody crop” plant matter like switchgrass may be far more energy-efficient, say some experts.

One huge potential drawback of ethanol is the diversion of corn crops from the food supply to produce the fuel. This practice has been blamed for skyrocketing food prices and food shortages around the world, which have led to food riots in several countries. At the same time, the federal government gave billions of dollars in subsidies to corn farmers to raise the grain for ethanol production, even as grain prices soared. The food-related concerns prompted the United Nations to call for a moratorium on food-based ethanol production until nonfood sources of alternative fuels could be developed.

Biodiesel Fuel Biodiesel is a fuel made primarily from vegetable oils, fats, or greases—most famously from recycled restaurant grease. Biodiesel fuel can be used in most older diesel engines without modifying them; however, newer diesel manufacturer guides do not often go beyond a 5% mixture. Biodiesel is the fastest-growing alternative fuel in the United States, is biodegradable, and produces lower levels of most air pollutants than petroleum-based products.

Biodiesel, like ethanol, can be problematic depending on its material source. It is carbon-neutral when the plants that are used to make it, such as soy beans and palm oil trees, absorb CO₂ as they grow and offset the CO₂ produced while making and using biodiesel. Most of the biodiesel used in the United States is made from soybean oil that is a byproduct of processing soybeans for animal feed and numerous other food and nonfood products, and from waste animal fat and grease. However, in some parts of the world natural vegetation and forests have been cleared and burned to grow soybeans and palm oil trees to make biodiesel, and these negative environmental and social effects can outweigh any benefit.

Hybrid and Electric Vehicles A more positive trend has been the introduction of hybrid and electric vehicles. Hybrid (HEV) vehicles use two or more distinct power sources to propel the vehicle, such as an onboard energy storage system (batteries, for example) and an internal combustion engine and electric motor. The hybrid vehicle typically realizes greater fuel economy than a conventional car does and produces fewer polluting emissions. Hybrids also tend to run with less noise than conventional vehicles. Several hybrid models are currently available in the United States, but they typically cost several thousand dollars more than their conventional gas-powered counterparts. Still, hybrids are gaining popularity with consumers and are being more commonly used in both corporate and government vehicle fleets.

A second generation of all-electric vehicles (EVs) has recently been introduced to consumer markets, taking advantage of better battery storage performance, “quick-charging station” infrastructure, and changing consumer perceptions of trip use and distance.



A new generation of electric vehicles is taking advantage of the development of infrastructure to support its use.

Researchers hope that hybrid and battery technologies can be extended to all classes of vehicles and that Americans, along with people around the world, can be convinced to use more fuel-efficient vehicles and to travel more frequently on public transportation, in carpools, or on foot.

Indoor Air Quality (IAQ)

Although most people associate air pollution with the outdoors, buildings may also harbor potentially dangerous pollutants. Some of these compounds trigger allergic responses, and others have been linked to cancer. Common indoor pollutants include the following:

- *Environmental tobacco smoke (ETS)* is a human carcinogen that also increases the risk of asthma, bronchitis, and cardiovascular disease (see Chapter 11). Most states and cities have passed legislation known as clean indoor air acts, which state that any enclosed, indoor areas used by the public shall be smoke-free except for certain designated areas.
- *Carbon monoxide and other combustion by-products* can cause chronic bronchitis, headaches, dizziness, nausea, fatigue, and even death. Common sources in the home are woodstoves, fireplaces, kerosene heaters and lamps, and gas ranges. In poverty-stricken areas, especially in Asia and Africa, people commonly burn solid fuels like coal for cooking and heating their homes. The World Health Organization (WHO) says the smoke and by-products from these indoor fires kill about 1.5 million people annually—mostly children.
- *Volatile organic compounds (VOCs)* are gases emitted from certain solids and liquids. VOCs are responsible for the smell from a freshly painted room, the creosote-soaked smell of a beach boardwalk, and even the otherwise satisfying “new car smell.” The concentration of many organic compounds is up to 10 times higher indoors than outdoors and can be over 1,000 times higher after activities like paint stripping. VOCs are found in paints, lacquers, cleaning supplies, aerosols,

building materials, furnishings, and office equipment. While these VOCs are widely considered a major health risk, no regulatory standards have been set for VOCs in nonindustrial environments, although LEED standards from the U.S. Green Building Council address building material composition and adequate ventilation.

- *Biological pollutants* include bacteria, dust mites, mold, and animal dander, which can cause allergic reactions and other health problems. These allergens are typically found in bathrooms, damp or flooded basements, humidifiers, air conditioners, and even some carpets and furniture.

- *Indoor mold*, the fuzzy black substance growing on shower tiles and damp basement walls, is an indoor pollutant not to be taken lightly. Even though more than 100 common indoor molds have been classified as potentially hazardous to people, only a few are serious threats to human health. One of the most common of these is *Stachybotrys* mold, commonly known as “toxic black mold.” It is greenish black in color and appears slimy when wet. Toxic mold spores permeate the air and can cause health problems when inhaled, especially for people with asthma and other respiratory conditions.

Less than 1% of the world’s fresh water is readily accessible for human use.

Preventing Air Pollution

You can do a great deal to reduce air pollution. Here are a few ideas:

- Cut back on driving. Ride your bike, walk, use public transportation, or carpool in a fuel-efficient vehicle.
- Keep your car tuned up and well maintained. Keep your tires inflated at recommended pressures. To save energy when driving, avoid quick starts, stay within the speed limit, limit the use of air conditioning, and don’t let your car idle unless absolutely necessary. Have your car’s air conditioner checked and serviced by a station that uses environmentally friendly refrigerants (automotive air conditioners made before 1994 are a major source of CFCs).
- Buy energy-efficient appliances and use them only when necessary. Run the washing machine, dryer, and dishwasher only when you have full loads, do laundry in warm or cold water instead of hot, and don’t overdry your clothes. Clean refrigerator

coils and clothes dryer lint screens frequently. Towel or air-dry your hair rather than using an electric dryer.

- Replace incandescent bulbs with LED and compact fluorescent bulbs (not fluorescent tubes). For more information, see the box “High-Efficiency Lighting.”

- Make sure your home is well-insulated with ozone-safe agents; use insulating shades and curtains to keep heat in during winter and out during summer.

- Plant and care for trees in your yard and neighborhood. They recycle carbon dioxide, so trees work against global warming. They also provide shade and cool the air so less air conditioning is needed.

- Before discarding a refrigerator, air conditioner, or humidifier, check with the waste hauler or your local government to ensure that ozone-depleting refrigerants will be removed prior to disposal.

- Keep your house adequately ventilated, and buy some houseplants—they have a natural ability to rid the air of harmful pollutants.

- Keep paints, cleaning agents, and other chemical products tightly sealed in their original containers.

- Don’t smoke, and don’t allow others to smoke in your room, apartment, or home. If these rules are too strict for your situation, limit smoking to a single, well-ventilated room.

- Clean and inspect chimneys, furnaces, and other appliances regularly. Install carbon monoxide detectors.

WATER QUALITY AND POLLUTION

Few parts of the world have enough safe, clean drinking water, and yet few things are as important to human health.

Water Contamination and Treatment

Many cities rely at least in part on wells that tap local groundwater, but often it is necessary to tap lakes and rivers to supplement wells. Because such surface water is more likely to be contaminated with both organic matter and pathogenic microorganisms, it is purified in water treatment plants before being piped into the community. At treatment facilities, the water is subjected to various physical and chemical processes, including screening, filtration, and disinfection (often with chlorine), before it is introduced into the water supply system. **Fluoridation**, a water treatment process that reduces

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your views on the issue of climate change? Do you believe it is a real problem, or that it has been overly hyped by the media and some politicians and activist groups? How do you support your views?

fluoridation The addition of fluoride to the water supply to reduce tooth decay.

TERMS



TAKE CHARGE

High-Efficiency Lighting

Using energy-efficient lighting—either solid-state *light-emitting diodes (LEDs)* or *compact fluorescent lightbulbs (CFLs)*—is a good way to cut your home's energy use, lower your energy bills, and reduce your environmental footprint.

According to the EPA, LEDs and CFLs are cost-effective because they use 10–25% of the energy of traditional incandescent lightbulbs. Although both types of bulbs initially cost more than regular lightbulbs, over the long term they save money for the user. The savings come from two differences between incandescent bulbs and high-efficiency bulbs. First, high-efficiency bulbs use much less energy by requiring less electricity to produce light. For example, a 17W LED bulb produces as much light as a 75W incandescent lightbulb. Second, they last longer: CFLs also last up to 10 times longer than conventional lightbulbs, and some LED bulbs have useful lives of over 22 years.

Lighting uses 10% of home electricity. The EPA says that if every American home replaced one incandescent bulb with a CFL, enough energy would be saved in one year to light 3 million homes. It would also reduce greenhouse gas emissions by an amount equal to the output of 800,000 cars.

The Energy Independence and Security Act (EISA) of 2007 set national performance standards on lightbulbs for the first time and directed the Federal Trade Commission to develop new lighting “nutrition” labels featuring lumens (the brightness or total “amount” of visible light) rather than watts, annual energy cost, and product lifespan. Incandescent bulbs like the traditional 100W bulb (and the 75W incandescent in 2013; and 40W

and 60W bulbs in 2014) do not meet the new standard, although halogen incandescent bulbs, which use 25% less energy than traditional bulbs, are included. The new EISA standard is projected to save consumers \$6 billion by 2015.

Despite their positive attributes, earlier compact fluorescent bulbs had a downside: they contained a gas that included low-pressure mercury and argon. Mercury vapor from broken bulbs can harm babies, children, and pregnant women, and the bulbs can pollute the environment if dumped in the trash. If all the CFLs

currently in use were disposed of in landfills, they could generate about 30,000 pounds of mercury that could eventually leach into the groundwater system. For this reason, it is best to take your burned-out CFLs (and all fluorescent bulbs) to a recycling center for proper disposal.

Even though the amount of mercury in a single CFL is very small, an average of 4 mgs, you should take extra precautions when cleaning up a broken bulb. If a CFL breaks, shut off the central heating/air conditioning system, open a window, and clear all people and animals out of the room for at least 15 minutes. Put on rubber or latex gloves, and carefully pick up the large pieces of glass. Put

the pieces in a glass jar that can be closed with a lid or in a heavy-duty plastic bag that can be sealed. Gently sweep up the small pieces and dust using a broom and dustpan. You can use duct tape to pick up fine particles. Seal everything up (including your gloves) in the jar or bag, and take it to a recycling center for disposal.

CFL manufacturers have reduced the content of mercury in their bulbs at least 20 percent over the past few years, with some dropping mercury content to 1 mg per bulb. Solid-state LED bulbs do not contain any toxic materials.



tooth decay by 15–40%, has been used successfully in the United States for more than 60 years.

In most areas of the United States, water systems have adequate, dependable supplies, are able to control waterborne disease, and provide water without unacceptable color, odor, or taste. However, problems occur. In 1993 more than 400,000 people became ill and 100 died when Milwaukee's drinking water was contaminated with the bacterium *Cryptosporidium*. The Centers for Disease Control and Prevention (CDC) estimate that 1 million Americans become ill and 900–1000 die each year from microbial illnesses from drinking water. Pollution by hazardous chemicals from manufacturing, agriculture, and household wastes is another concern. (Chemical pollution is discussed later in the chapter.) Worldwide, more than 2 million people, mostly children, die from water-related diseases each year.

Water Shortages

Water shortages are a growing concern in many regions of the world. Some parts of the United States, such as the desert West, are experiencing rapid population growth that outstrips the ability of local systems to provide adequate water to all. Many proposals are being discussed to relieve these shortages, including long-distance transfers; conservation; the recycling of some water, such as the water in office building air conditioners; and the sale of water by regions with large supplies to areas with less available water.

According to the World Health Organization (WHO), 1.1 billion people do not have safe drinking water and 2.4 billion do not have access to basic sanitation. Less than 1% of the world's fresh water—about 0.007% of all the water on earth—is readily accessible for direct human use.



Most communities in the United States draw on surface water for their drinking water supply. Unlike groundwater, surface water is never free of contaminants and has to be treated before it is safe for humans to drink.

Groundwater pumping and the diversion of water from lakes and rivers for irrigation are further reducing the amount of water available to local communities. In some areas, groundwater is being removed at twice the rate at which it is replaced. The Aral Sea, located in Kazakhstan and Uzbekistan, was once one of the world's largest inland seas. Since the 1960s it has lost two-thirds of its volume to irrigation, and the exposed seabed is now as big as the Netherlands. People living in the area have experienced severe water and food shortages and increased rates of respiratory disease and throat cancer linked to dust storms from the dry seabed. Due to agricultural diversions, in 1972 the Yellow River ran dry for the first time in China's 3000-year history, failing to reach the sea for 15 days that year; now the dry period extends for more than half of each year. In the United States, the Colorado River is now diverted to the extent that it no longer flows into the ocean.

Sewage

Prior to the mid-19th century, many people contracted diseases such as typhoid, cholera, and hepatitis A by direct contact with human feces, which were disposed of at random. After the links between sewage and disease were discovered, practices began to change. People learned how to build sanitary outhouses and how to locate them so they would not

contaminate water sources. As plumbing moved indoors, sewage disposal became more complicated. In rural areas, the **septic system**, a self-contained sewage disposal system, worked quite well. Today many rural homes still rely on septic systems; however, many old septic systems leak contaminants into the environment.

Different approaches became necessary as urban areas developed. Most cities have sewage treatment systems that separate fecal matter from water in huge tanks and ponds and stabilize it so that it cannot transmit infectious diseases. After it is treated and biologically safe, the water is released back into the environment. The sludge that remains behind is often contaminated with **heavy metals** and is handled as hazardous waste. If not contaminated, sludge may be used as fertilizer, although this practice is being discouraged by scientists and some government agencies and is not permitted in organic agriculture. If incorporated into the food chain, heavy metals,

septic system A self-contained sewage disposal system, often used in rural areas, in which waste material is decomposed by bacteria.

heavy metal A metal with a high specific gravity, such as lead, copper, or tin.

TERMS

such as lead, cadmium, copper, and tin, can cause illness or death. Therefore, these chemicals must not be released into the environment when sludge is burned or buried.

In addition to regulating industrial discharge, many cities have expanded sewage treatment measures to remove heavy metals and other hazardous chemicals. This action has resulted from many studies linking exposure to chemicals such as mercury, lead, and **polychlorinated biphenyls (PCBs)** with long-term health consequences, including cancer and damage to the central nervous system. The technology to effectively remove heavy metals and chemicals from sewage is still developing, and the costs involved are immense.

Protecting the Water Supply

By reducing your own water use, you help preserve your community's valuable supply and lower your monthly water bill. By taking steps to keep the water supply clean, you reduce pollution overall and help protect the land, wildlife, and other people from illness. Here are some simple steps you can take to protect your water supply:

- Take showers, not baths, to minimize your water consumption. Don't let water run when you're not actively using it while brushing your teeth, shaving, or hand-washing clothes. Don't run a dishwasher or washing machine until you have a full load.
- Install sink faucet aerators and water-efficient showerheads, which use two to five times less water with no noticeable decrease in performance.
- Purchase a water-saving toilet, or put a displacement device in your toilet tank to reduce the amount of water used with each flush.
- Fix any leaky faucets in your home. Leaks can waste thousands of gallons of water per year.
- Don't pour toxic materials such as cleaning solvents, bleach, or motor oil down the drain. Store them until you can take them to a hazardous waste collection center.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How would you describe the quality of the water where you live? Are there lakes or streams where you can safely swim or fish? What local information sources can you find about water quality in your area?

polychlorinated biphenyl (PCB) An industrial chemical used as an insulator in electrical transformers and linked to certain human cancers; banned worldwide since 1977 but persistent in the environment.

TERMS

- Don't pour old medicines down the drain or flush them down the toilet. A 2008 report by the Associated Press revealed that the drinking water of some 40 million Americans may be contaminated with prescription and over-the-counter drugs. Some medications enter the water system after human excretion into sewage systems, but many people flush old or unused medicines. The EPA is working on strategies to remove medicines from drinking water, but for now says the drugs appear only in trace amounts and generally are not considered a health hazard. Still, experts say the best way to discard old medicines is to mix them with coffee grounds or cat litter, seal them in a container, and put them in the trash.

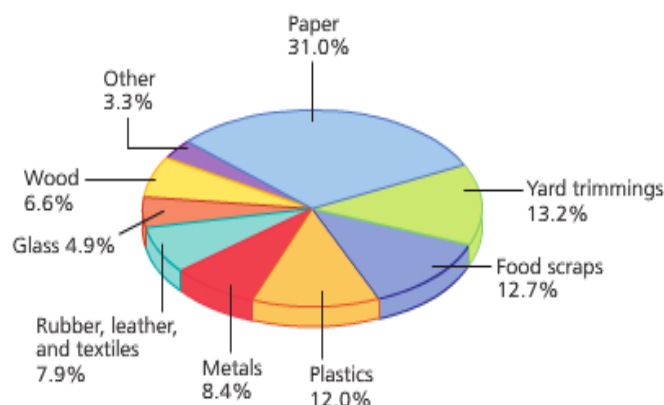
SOLID WASTE POLLUTION

Humans living in the developed world generate huge amounts of waste, which must be handled appropriately if the environment is to be kept safe.

Solid Waste

The bulk of the organic food garbage produced in American kitchens is now dumped in the sewage system by way of the mechanical garbage disposal. The garbage that remains is not hazardous from the standpoint of infectious disease because there is very little food waste in it, but it does represent an enormous disposal and contamination problem.

What's in Our Garbage? In 2010 Americans generated about 250 million tons of trash and recycled 85 million tons of materials. The biggest single component of household trash by weight is paper products, including junk mail, glossy mail-order catalogs, and computer printouts (Figure 19.3). Yard waste, plastic, metals, and glass are other significant components. About 1% of the solid waste is toxic; a new



Due to rounding, these numbers do not add up to 100%.

FIGURE 19.3 Components of municipal solid waste, by weight, before recycling.

SOURCE: Environmental Protection Agency, 2011. *Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2010*. Washington, DC: Environmental Protection Agency. Pub. No. EPA-530-F-11-005.

source of toxic waste is the disposal of computer components in both household and commercial waste. Burning, as opposed to burial, reduces the bulk of solid waste, but it can release hazardous material into the air, depending on what is being burned.

Solid waste is not limited to household products. Manufacturing, mining, and other industries all produce large amounts of potentially dangerous materials that cannot simply be dumped. At Love Canal (near Buffalo, New York), toxic industrial wastes had been dumped into a waterway for years until, in the 1970s, nearby residents began to suffer from associated birth defects and cancers. The government had to step in, people had to move from their homes, and huge costs were incurred.

QUICK STATS

The average American generates **4.5 pounds of trash per day**; about **1.5 pounds of this is recycled**.

—Environmental Protection Agency, 2010

liners are used around the site, and nearby monitoring wells are now required in most states. Layers of solid waste are regularly covered with thin layers of dirt until the site is filled. Some communities then plant grass and trees and convert the site into a park. Landfill is relatively stable; almost no decomposition occurs in the solidly packed waste.

Burying solid waste in landfills has several disadvantages. Much of this waste contains chemicals, ranging from leftover pesticides to paints and oils, that should not be released into the environment. Despite precautions, buried contaminants sometimes leak into the surrounding soil and groundwater. Burial is also expensive and

requires huge amounts of space.

Disposing of Solid Waste Since the 1960s, billions of tons of solid waste have been buried in **sanitary landfill** disposal sites (Figure 19.4). Careful site selection and daily management are an essential part of this approach to disposal. The site is thoroughly studied to ensure that it is not near groundwater, streams, or any other source of water that could be contaminated by leakage from the landfill. Sometimes protective

Biodegradability *Biodegradation* is the process by which organic substances are broken down naturally by living

sanitary landfill A disposal site where solid wastes are buried.

TERMS

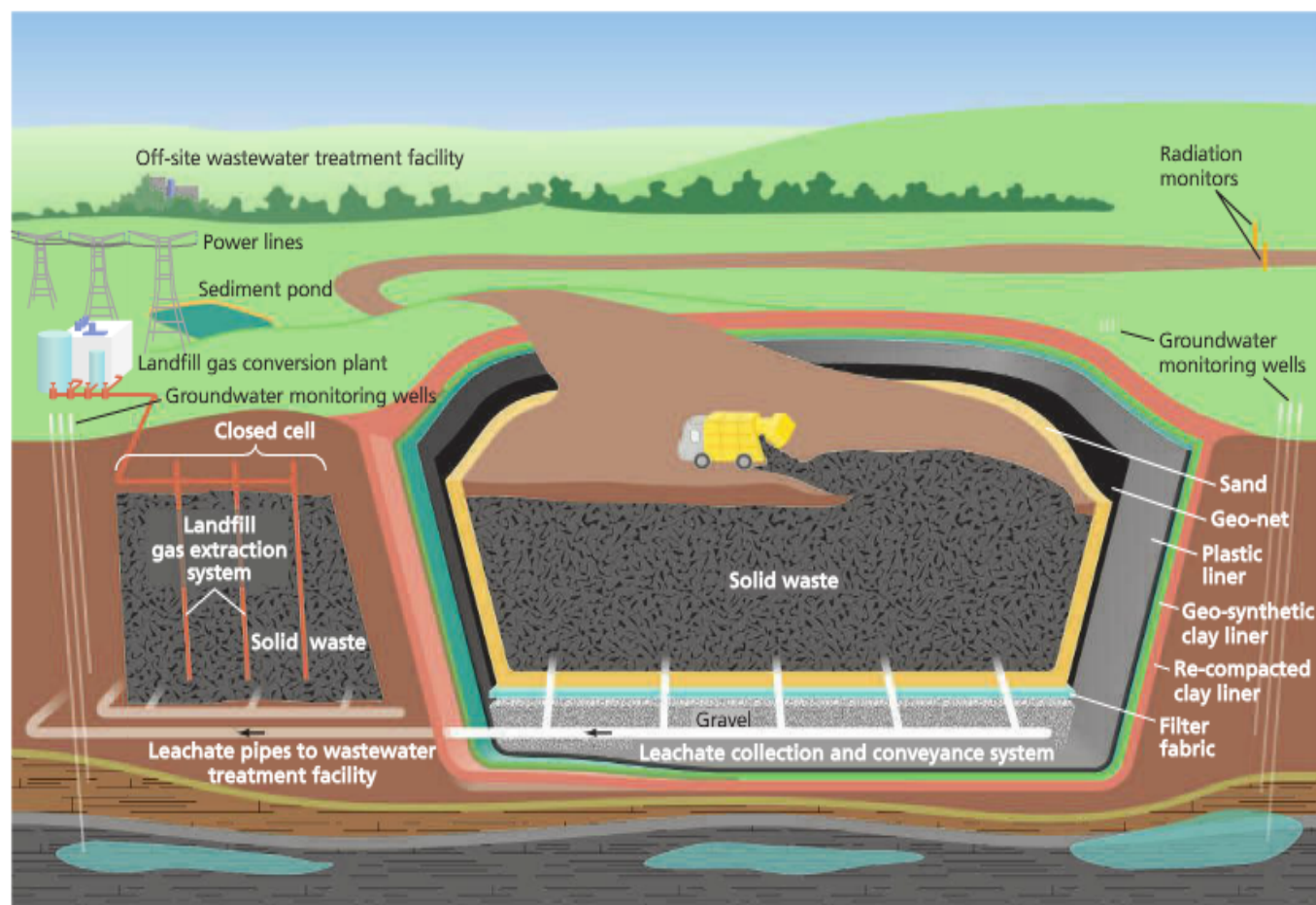


FIGURE 19.4 A sanitary landfill.

Table 19.3**Biodegrading Times
of Different Objects**

ITEM	TIME REQUIRED TO BIODEGRADE
Banana peel	2–10 days
Paper	2–5 months
Rope	3–14 months
Orange peel	6 months
Wool sock	1–5 years
Cigarette butt	1–12 years
Plastic-coated milk carton	5 years
Aluminum can	80–100 years
Plastic six-pack holder ring	450 years
Glass bottle	1 million years
Plastic bottle	Forever

organisms. Organic materials can be degraded either aerobically (with oxygen) or anaerobically (without oxygen). These organic materials—including plant and animal matter, substances originating from living organisms, or artificial materials similar in nature to plants and animals—are put to use by microorganisms. The term **biodegradable** means that certain products can break down naturally, safely, and quickly into the raw materials of nature, then disappear back into the environment. Table 19.3 shows the amount of time required for different types of material to biodegrade.

Recycling Because of the expense and potential chemical hazards of any form of solid waste disposal, many communities encourage individuals and businesses to recycle their trash. In **recycling**, many kinds of waste materials are collected and used as raw materials in the production of new products. For example, waste paper can be recycled into new paper products, or an old bicycle frame can be melted down and used in the production of appliances. The number of recycling opportunities is almost limitless. Recycling is a good idea for two reasons. First, it puts unwanted objects back to good use. Second, it reduces the amount of solid waste sitting in landfills, some of which takes decades to decay naturally. Some cities offer curbside pickup of recyclables; others have recycling centers where people can bring their waste. These materials are not limited to paper, glass, and cans but also include things such as discarded tires and used oils.

Even as recycling grows in popularity, however, the total amount of garbage Americans generate will probably continue

biodegradable Refers to the ability of some materials to break down naturally and disappear back into the environment.

recycling The use of waste materials as raw materials in the production of new products.

TERMS

to rise as the population increases. Researchers estimate that 80% of the nation's landfills will be closed within 20 years.

Discarded Technology: eWaste A newer solid waste disposal problem involves the discarding of old computers, televisions, cell phones, MP3 players, and other electronic devices. Americans scrap about 400 million consumer electronic devices each year. This “e-waste” is the fastest-growing portion of our waste stream. Junked electronic devices are toxic because they contain varying amounts of lead, mercury, and other heavy metals. Many components of electronic devices are valuable, however, and can be recycled and reused. Local and state e-waste recycling programs are becoming more common, and private companies are also getting into the e-waste recycling business. If you recycle your electronic devices, look for a “green” program or one that is certified by e-stewards, an organization that advocates for responsible e-waste recycling (www.e-stewards.org).

Reducing Solid Waste

By reducing your consumption, recycling more, and throwing away less, you can conserve landfill space and put more reusable items back into service. Here are some ideas to help you reduce solid waste:

- Buy products with the least amount of packaging you can, or buy products in bulk (see the box “How to Be a Green Consumer”). For example, buy large jars of juice, not individually packaged juice drinks. Buy products packaged in recyclable containers.
- Buy recycled or recyclable products. Avoid disposables; instead use long-lasting or reusable products such as refillable pens and rechargeable batteries.
- Avoid using foam or paper cups and plastic stirrers by bringing your own ceramic coffee mug and metal spoon to work or wherever you drink coffee or tea. Pack your lunch in reusable containers.
- To store food, use glass jars and reusable plastic containers rather than foil and plastic wrap.
- Recycle your newspapers, glass, cans, paper, and other recyclables. If you receive something packaged with foam pellets, take them to a commercial mailing center that accepts them for recycling.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your own waste disposal habits like? Do you recycle everything you possibly can? Do you get rid of items that are still usable? Even if you are conscientious about the way you deal with waste, how could you improve your habits?

CRITICAL CONSUMER

How to Be a Green Consumer



Consider the environmental impact of the things you buy. A few simple choices can make a big difference without compromising your lifestyle. You can quickly and easily develop habits that direct your consumer dollars toward environmentally friendly products and companies.

- Remember the four Rs of green consumerism:
 - Reduce the amount of trash and pollution you generate by consuming and throwing away less.
 - Reuse as many products as possible—either yourself or by selling them or donating them to charity.
 - Recycle all appropriate materials and buy recycled products whenever possible.
 - Respond by educating others about reducing waste and recycling, by finding creative ways to reduce waste and toxicity, and by making your preferences known.
- Choose products packaged in refillable, recycled, reusable containers or in readily recyclable materials, such as paper, cardboard, aluminum, or glass. Don't buy products that are excessively packaged or wrapped. A number of European governments have instituted the concept of Extended Producer Responsibility (EPR), or product stewardship. This program includes incentives to manufacturers to design environmentally friendly packaging and holds companies responsible for the end-of-life costs of their products. Similar efforts are under way in the United States.
- Look for products made with the highest possible content of recycled paper, metal, glass, plastic, and other materials.
- Choose simple products containing the lowest amounts of bleaches, dyes, and fragrances. Look for organically grown



foods and for clothing made from organically grown cotton or naturally colored cotton.

- Buy high-quality appliances that have an Energy Star seal from the EPA or some other type of certification indicating that they are energy- and water-efficient.
- Get a reusable cloth shopping bag. Don't bag items that don't need to be bagged. If you forget to bring your bag to the store, use paper bags to carry your purchases home—and reuse or recycle those bags.
- Don't buy what you don't need—borrow, rent, or share. Take good care of the things you own, repair items when they break, and replace them with used rather than new items whenever possible.
- Walk or bike when you can. If you must drive, do several errands at once to save energy and cut down on pollution.
- Look beyond the products to the companies that make them. Support those with good environmental records. If some of your favorite products are overpackaged or contain harmful ingredients, write to the manufacturer.
- Keep in mind that doing something is better than doing nothing. Even if you can't be a perfectly green consumer, doing your best on any purchase will make a difference.

SOURCES: U.S. Environmental Protection Agency. 2010. *The Consumer's Handbook for Reducing Solid Waste* (<http://www.epa.gov/osw/wycd/catbook>); Natural Resources Defense Council. 2012. *NRDC's Smarter Living* (<http://www.nrdc.org/living/default.asp>).

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- Do not throw electronic items, batteries, or fluorescent lights into the trash. Take these to state-approved recycling centers; check with your local disposal service for more information.
- Start a compost pile for your organic garbage (non-animal food and yard waste) if you have a yard. If you live in an apartment, you can take your organic wastes to a community composting center. Many communities now offer curbside collection of kitchen scraps for recycling into compost, which is sold to farms and wineries.

CHEMICAL POLLUTION AND HAZARDOUS WASTE

Chemical pollution is by no means a new problem. The ancient Romans were plagued by lead poisoning; industrial chemicals have claimed countless lives over the past few centuries.

Today new chemical substances are constantly being introduced into the environment as pesticides, herbicides, solvents, and hundreds of other products. More people and wildlife are exposed to them than ever before.

The problems of chemical pollution and hazardous waste became so prominent in the 1970s that the EPA established the Superfund program to clean up the nation's uncontrolled hazardous waste sites. A national priorities list determines which locations get cleaned up. To date, the EPA has completed cleanups at hundreds of hazardous waste sites. As the Superfund program matures, so do the size, complexity, and cost of cleanup work. The EPA also pushes industrial polluters to pay the costs of cleanups, as in the case of the cleanup of PCBs from the Hudson River by General Electric.

Asbestos

A mineral-based compound, asbestos was widely used for fire protection and insulation in buildings until the late 1960s. As described in Chapter 16, microscopic asbestos fibers can be released into the air when this material is applied or when it later deteriorates or is damaged. These fibers can lodge in the lungs, causing **asbestosis**, lung cancer, and other serious lung diseases. Similar conditions expose workers to risk in the coal mining industry, from coal and silica dust (black lung disease), and in the textile industry, from cotton fibers (brown lung disease).

Asbestos can pose a danger in homes and apartment buildings, about 25% of which are thought to contain some asbestos. Areas where it is most likely to be found are insulation around water and steam pipes, ducts, and furnaces; boiler wraps; vinyl flooring; floor, wall, and ceiling insulation; roofing and siding; and fireproof board.

Lead

Thanks to better preventive efforts, lead poisoning is not as serious a problem today as it was in the past. Still, the CDC estimates that about 435,000 children under age 6 may have unsafe lead levels in their blood; the actual number could be much higher. Many of these children live in poor, inner-city areas (see the box "Poverty, Gender, and Environmental Health"). When lead is ingested or inhaled, it can damage the central nervous system, cause mental impairment, hinder oxygen transport in the blood, and create digestive problems. Se-

vere lead poisoning may cause coma or even death. Neurological damage can be permanent.

Long-term exposure to low levels of lead may cause kidney disease; it can also cause lead to build up in bones, where it may be released into the bloodstream during pregnancy or when bone mass is lost from osteoporosis.

Lead-based paints are the chief culprit in lead poisoning of children. They were banned from residential use in 1978, but as many as 57 million American homes still contain lead paint. In 2006 the EPA proposed new guidelines requiring contractors to take special lead containment measures when doing renovations, repairs, or painting in certain buildings. This became law in April 2008; full implementation took effect in April 2010. The use of lead in plumbing is now also banned, but some old pipes and faucets contain lead.

QUICK

STATS

The Superfund
national priorities
list included
**1,305 sites as
of May 2012.**

—EPA, 2012

Pesticides

Pesticides are used primarily for two purposes: to prevent the spread of insect-borne diseases and to maximize food production by killing insects that eat crops. Both uses have risks as well as benefits. For example, DDT was extremely effective in controlling insect-borne diseases in tropical countries and in increasing crop yields throughout the world, but it was found to disrupt the life cycles of birds, fish, and reptiles and was banned in the United States in 1972. DDT also builds up in the food chain, increasing in concentration as larger animals eat smaller ones—a process known as **biomagnification**.

Mercury

A naturally occurring metal, mercury is a toxin that affects the nervous system and may damage the brain, kidneys, and gastrointestinal tract; increase blood pressure, heart rate, and heart attack risk; and cause cancer. Mercury slows fetal and child development and causes irreversible deficits in brain function. As many as 600,000 babies are born each year having been exposed to unsafe levels of mercury. Coal-fired power plants are the largest producers of mercury; other sources include mining and smelting operations and the disposal of consumer products containing mercury.

Mercury persists in the environment and, like pesticides, it is bioaccumulative. In particular, large, long-lived fish may carry high levels of mercury. Chapter 12 includes information about safe fish consumption.

Other Chemical Pollutants

The list of real and potential chemical pollution problems may well be as long as the list of known chemicals. As mentioned earlier, hazardous wastes are commonly found in the home

asbestosis A lung condition caused by inhalation of microscopic asbestos fibers, which inflame the lung and can lead to lung cancer.

pesticides Chemicals used to prevent the spread of diseases transmitted by insects and to maximize food production by killing insects that eat crops.

biomagnification The accumulation of a substance in a food chain.

TERMS

DIVERSITY MATTERS

Poverty, Gender, and Environmental Health



Residents of poor and minority communities are often exposed to more environmental toxins than are residents of wealthier communities, and they are more likely to suffer from health problems caused or aggravated by pollutants.

Poor neighborhoods are often located near highways and industrial areas that have high levels of air and noise pollution; they are also common sites for hazardous waste production and disposal. Residents of substandard housing are more likely to come into contact with lead, asbestos, carbon monoxide, pesticides, and other hazardous pollutants associated with peeling paint, old plumbing, and poorly maintained insulation and heating equipment.

In addition, poor people are more likely to have jobs that expose them to asbestos, silica dust, and pesticides, and they are more likely to catch and consume fish contaminated with PCBs, mercury, and other toxins.

The most thoroughly researched and documented link among poverty, the environment, and health is lead poisoning in children. Many studies have shown that children of low-income black families are much more likely to have elevated levels of lead in their blood than are white children. One survey found that two-thirds of urban African American children from families earning less than \$6000 a year had elevated lead levels. The CDC and the American Academy of Pediatrics recommend annual testing of blood lead levels

for all children under age 6, with more frequent testing for children at special risk.

Asthma is another health threat that appears to be linked with both environmental and socioeconomic factors. The number of Americans with asthma has grown dramatically in the past 20 years; most of the increase has occurred in children, with African Americans and the poor hardest hit. Researchers are not sure what accounts for this increase, but suspects include household pollutants, pesticides, air pollution, cigarette smoke, and allergens like cockroaches. These risk factors are likely to cluster in poor urban areas where inadequate health care may worsen asthma's effects.

Gender also influences exposure to environmental hazards. In many societies, women are more often involved in day-to-day activities associated with the environment, including food preparation, agricultural work, and tasks around the home. These activities can expose women to indoor air pollution, water pollution, foodborne pathogens, agricultural chemicals, and waste contamination. Indoor pollutants, especially soot from burning wood, charcoal, and other solid fuels used for home heating and cooking, are a particular risk. Exposure to this particulate pollution increases the risk of respiratory diseases, lung cancer, and reproductive problems. In 2010 U.S. Secretary of State Hillary Clinton launched the Global Alliance for Clean Cookstoves to help hun-

dreds of millions of people, mostly women, avoid the toxic smoke produced by traditional stoves and open fires used in poorly ventilated indoor areas.

All humans are exposed to chemicals in air, food, and drinking water, and we all carry a body load of chemicals. Some of these chemicals bioaccumulate in our bones, blood, or fatty tissues. Women are smaller than men, on average, and have a higher percentage of body fat, so chemicals that accumulate in fatty tissue may pose a relatively greater risk for women. On the other hand, men may be more likely to work in industries that involve significant occupational exposures to disease-related toxins. For example, coal miners have an increased risk of lung cancer (black lung disease).

Although any chemical exposure can be a concern for health, women face the added risk of passing pollutants to a developing fetus during pregnancy or to an infant through breastfeeding. Even relatively low exposure to pollutants can result in a significant chemical body load in an infant or young child because of their small body size. And because infants and children are still developing, the effects of chemical exposure can be significant and devastating. It is not unusual for dangerous toxin exposures to be first recognized through noticeable effects on infants or children.

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and should be handled and disposed of properly. They include automotive supplies (motor oil, antifreeze, transmission fluid), paint supplies (turpentine, paint thinner, mineral spirits), art and hobby supplies (oil-based paint, solvents, acids and alkalis, aerosol sprays), insecticides, batteries, computer and electronic components, and household cleaners containing sodium hydroxide (lye) or ammonia. These chemicals are dangerous when inhaled or ingested, when they contact the skin or the eyes, or when they are burned or dumped. Many cities provide guidelines about approved disposal methods and have hazardous waste collection days.

Preventing Chemical Pollution

You can take steps to reduce the chemical pollution in your community. Just as important, by reducing and eliminating

the number of chemicals in your home, you may save the life of a child or animal who might encounter one of those chemicals.

- When buying products, read the labels, and try to buy the least toxic ones available. Choose nontoxic, nonpetroleum

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Are there any hazardous chemicals in your home, such as cleaning products, solvents, paint, or batteries? Would you know what to do if one of these chemicals spilled? How would you clean it up?



Hazardous chemicals accumulate in many homes, as well as in businesses and industrial sites

cleansers, disinfectants, polishes, and other personal and household products.

- Dispose of your household hazardous wastes properly. If you are not sure whether something is hazardous or don't know how to dispose of it, contact your local environmental health office or health department.
- Buy organic produce and produce that has been grown locally.
- If you must use pesticides or toxic household products, store them in a locked place where children and pets can't get to them. Don't measure chemicals with food preparation utensils, and wear gloves whenever handling them.
- If you have your house fumigated for pest control, be sure to hire a licensed exterminator. Keep everyone, including pets, out of the house while the crew works and, if possible, for a few days after.

QUICK STATS

There are **104 nuclear power plants** operating in the United States.

—International Atomic Energy Agency, 2011

RADIATION POLLUTION

Radiation comes in different forms, such as ultraviolet rays, microwaves, or X-rays, and from different sources, such as the sun, uranium, and nuclear weapons (Figure 19.5). These forms of electromagnetic radiation differ in wavelength and energy, with shorter waves having the highest energy levels.

Of most concern to health are gamma rays produced by radioactive sources such as nuclear weapons, nuclear energy plants, and radon gas. These high-energy waves are powerful enough to penetrate objects and break molecular bonds. Although gamma radiation cannot be seen or felt, its effects at high doses can include **radiation sickness** and death. At lower doses, chromosome damage, sterility, tissue damage, cataracts, and cancer can occur. Other types of radiation can also affect health. For example, exposure to UV radiation from the sun or from tanning salons can increase the risk of skin cancer. The effects of some sources of radiation, such as cell phones, remain controversial.

Nuclear Weapons and Nuclear Energy

Nuclear weapons pose a health risk of the most serious kind to all species. Public health associations have stated that in the event of an intentional or unintentional discharge of these weapons, the casualties would run into the hundreds of thousands or millions. Reducing the stockpiles of nuclear weapons is a challenge and a goal for the 21st century.

Power-generating plants that use nuclear fuel also pose health problems. When **nuclear power** was first developed as an alternative to oil and coal, it was promoted as clean, efficient, inexpensive, and safe. In general, this has proven to be the case. Power systems in several parts of the world rely on nuclear power plants. However, despite all the built-in safeguards and regulating agencies, accidents in nuclear power plants do happen, many due to human error (as at Three Mile Island in Pennsylvania), and the consequences of such accidents are far more serious than those of similar accidents in other types of power-generating plants. The 1986 fire and explosion at the Chernobyl nuclear power station in Ukraine caused hundreds of deaths and increased rates of genetic mutation and cancer;

radiation Energy transmitted in the form of rays, waves, or particles.

TERMS

radiation sickness An illness caused by excess radiation exposure, marked by low white blood cell counts and nausea; possibly fatal.

nuclear power The use of controlled nuclear reactions to produce steam, which in turn drives turbines to produce electricity.

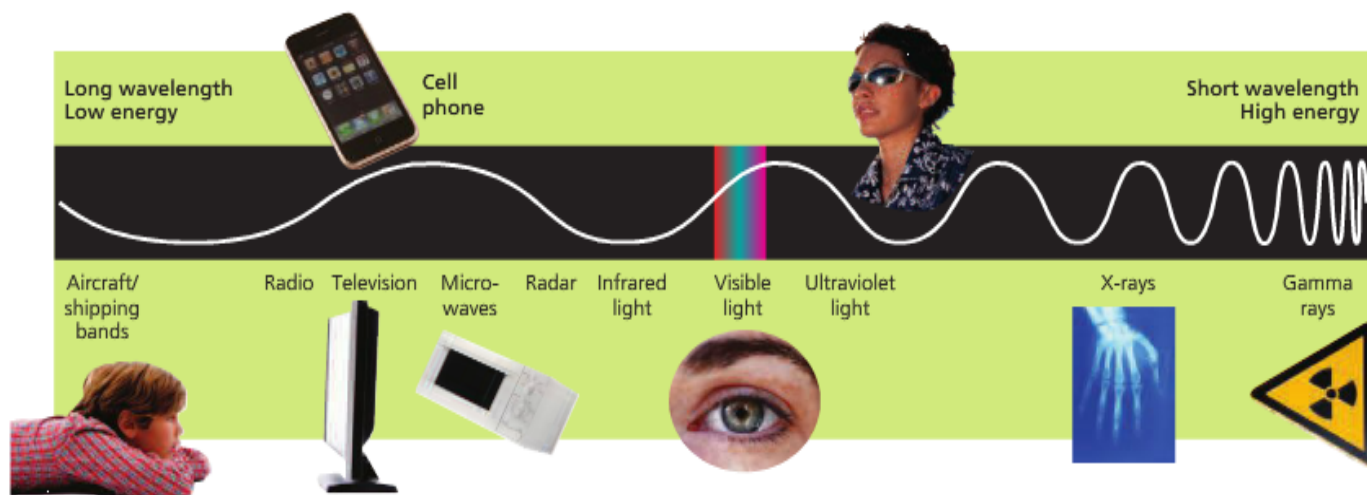


FIGURE 19.5 Electromagnetic radiation. Electromagnetic radiation takes the form of waves that travel through space. The length of the wave determines the type of radiation: The shortest waves are high-energy gamma rays; the longest are radio waves and extremely low-frequency waves used for communication between aircraft, ships, and submarines. Different types of electromagnetic radiation have different effects on health.

the long-term effects are not yet clear. The zone around Chernobyl has been sealed off to human habitation and could be unsafe for the next 24,000 years. And on March 11, 2011, a 9.0 magnitude earthquake 15 miles below Japan's Honshu Island, followed by a powerful tsunami, rocked Japan's northern Fukushima Prefecture and severely damaged the Fukushima Daiichi nuclear power plant complex. All nuclear plants in Japan were shut down following this incident.

An additional enormous problem is disposing of the radioactive wastes these plants generate. They cannot be dumped in a sanitary landfill because the amount and type of soil used to cap a sanitary landfill are not sufficient to prevent radiation from escaping. Deposit sites have to be developed that will be secure for tens of thousands of years—longer than the total recorded history of human beings on this planet. To date, no storage method has been devised that can provide infallible, infinitely durable shielding for nuclear waste. Despite these problems, nuclear power is gaining favor again as an alternative to fossil fuels.

Medical Uses of Radiation

Another area of concern is the use of radiation in medicine, primarily in X-rays. The development of machines that could produce images of internal bone structures was a major advance in medicine, and applications abounded. Chest X-rays were routinely used to screen for tuberculosis, and children's feet were even X-rayed in shoe stores to make sure their new shoes fit properly. But, as is often the case, this new technology had disadvantages. As time passed, studies revealed that X-ray exposure is cumulative and that no level of exposure is absolutely safe.

Early X-ray machines are no longer used because of the high amounts of radiation they gave off. Each new generation of X-ray machines has used less radiation more effectively.

From a personal health point of view, no one should ever have a "routine" X-ray examination; each such exam should have a definite purpose, and its benefits and risks should be carefully weighed.

Radiation in the Home and Workplace

Recently there has been concern about electromagnetic radiation associated with common modern devices such as microwave ovens, computer monitors, and even high-voltage power lines. These forms of radiation do have effects on health, but research results are inconclusive.

Another controversial issue today is the effect of radiation from cell phones on health. Cell phones use electromagnetic waves (radio frequency radiation) to send and receive signals. This radiation is not directional, meaning that it travels in all directions equally, including toward the user. Factors such as the type of digital signal coding in the network, the antenna and handset design, and the position of the phone relative to the head all determine how much radiation is absorbed by a user.

Specific absorption rate (SAR) is a way of measuring the quantity of radio frequency energy that is absorbed by the body. If you're concerned about limiting your exposure to possible radiation from your cell phone, look for a phone with a low SAR (some municipalities require phone manufacturers to provide this information on packaging). You can also text instead of calling, use a wired headset or speakerphone whenever possible, and carry your phone at least one inch from your body. Some researchers also caution against using your phone in areas with poor coverage since phones emit more radiation when searching for a signal. Because studies to date have not provided conclusive evidence, the CDC is beginning a long-term study to determine whether cell phone use actually exposes users to harmful levels of radiation.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you live in an area where radon is a problem? If so, has your home been checked for radon?

Another area of concern is **radon**, a naturally occurring radioactive gas found in certain soils, rocks, and building materials (see Chapter 16).

Avoiding Radiation

The following steps can help you avoid unneeded exposure to radiation:

- Get only X-rays that you need, and keep a record of the date and location of every X-ray exam. Don't have a full-body CT scan for routine screening; the radiation dose of one full-body CT scan is nearly 100 times that of a typical mammogram.
- Follow government recommendations for radon testing.
- Use sunscreen to protect yourself from the sun's UV radiation.

NOISE POLLUTION

We are increasingly aware of the health effects of loud or persistent noise in the environment. Concerns focus on two areas: hearing loss and stress. Prolonged exposure to sounds above 80–85 **decibels** (a measure of the intensity of a sound wave) can cause permanent hearing loss (Figure 19.6). Hearing damage can occur after eight hours of exposure to sounds louder than 80 decibels. Regular exposure for longer than one minute to more than 100 decibels can cause permanent hearing loss. Children may suffer damage to their hearing at lower noise levels than those at which adults suffer damage.

Two common sources of excessive noise are the workplace and large gatherings of people at sporting events, rock concerts, and movie theaters. The Occupational Safety and Health Administration (OSHA) sets legal standards for noise in the workplace, but no laws exist regulating noise levels at concerts, which can be much louder than most workplaces.

radon A naturally occurring radioactive gas emitted from rocks and natural building materials that can become concentrated in insulated homes, causing lung cancer.

decibel A unit for expressing the relative intensity of sounds on a scale from 0 for the average least perceptible sound to about 120 for the average pain threshold.

TERMS

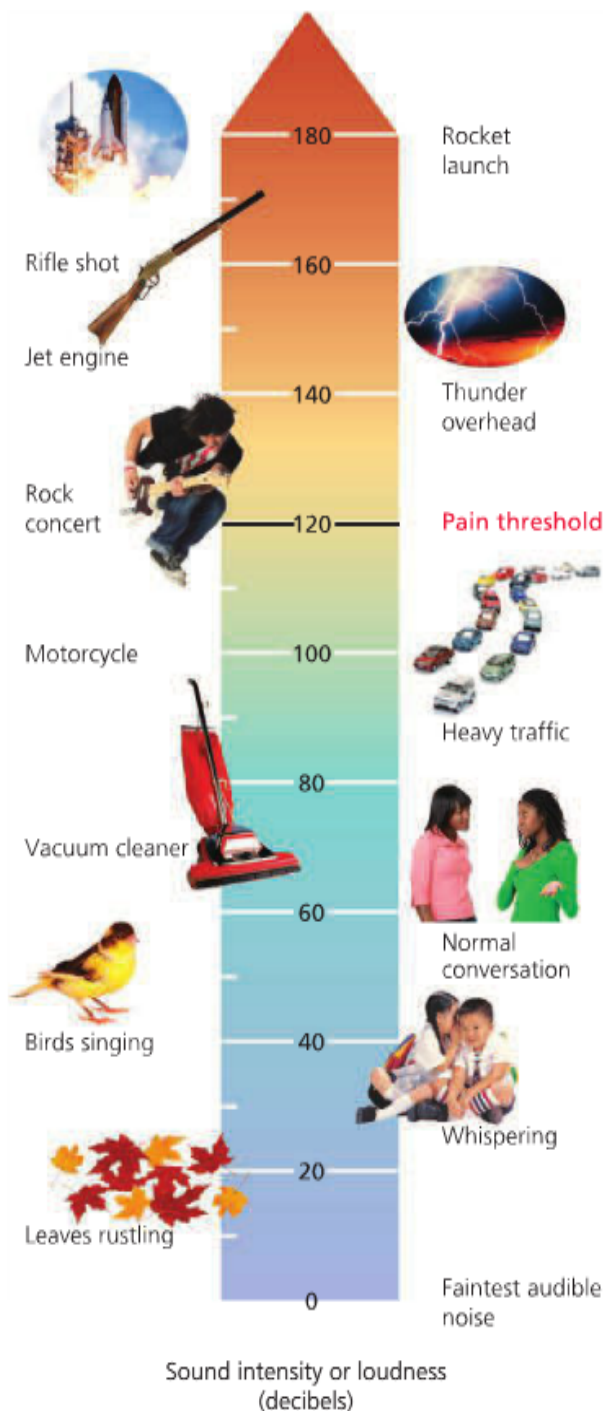


FIGURE 19.6 The intensity of selected sounds.

Here are some ways to avoid exposing yourself to excessive noise:

- Wear ear protectors when working around noisy machinery.
- When listening to music on a headset with a volume range of 1–10, keep the volume no louder than 6. Your headset is too loud if you are unable to hear people around you speaking in a normal tone of voice. Earmuff-style headphones may be easier on the ears than earbuds, which are inserted

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How often do you listen to loud music? Do you ever use headphones? At what volume level do you like to listen? Do you think your listening habits pose a threat to your hearing? Would you let a child listen at the same volume level?

into the ear canal. Experts warn that earbuds should not be used more than 30 minutes a day unless the volume is set below 60% of maximum; headphones can be used up to one hour. It is good to put covers over your earbuds because this can reduce the dB level a little. Do not push your earbuds in too far. Keep the volume quite a bit lower than you think you need because the sound is far louder than you realize.

- Avoid loud music. Don't sit or stand near speakers or amplifiers at a concert, and don't play a car radio or stereo so high that you can't hear the traffic.
- Avoid exposure to painfully loud sounds, and avoid repeated exposure to any sounds above 80 decibels.

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Connect to Your Choices

Have you ever thought about where you get your behaviors and habits related to the environment? Many factors can influence our behaviors and habits, some not as obvious as others. When you were growing up, was your family aware of environmental issues and respectful of the environment? Do people in your peer group dispose of their trash when they're outdoors, or do they leave trash behind? Does your school promote environmental awareness and action, such as by participating in the green campus movement, providing for the proper recycling of old computers, cell phones, and other e-waste, and celebrating Earth Day in meaningful ways?

What are the external factors that influence your choices about the environment? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

SUMMARY

- Environmental health encompasses all the interactions of humans with their environment and the health consequences of those interactions.

TIPS FOR TODAY AND THE FUTURE

Environmental health involves protecting ourselves from environmental dangers and protecting the environment from the dangers created by humans.

RIGHT NOW YOU CAN:

- Turn off the lights, televisions, and stereos in any unoccupied rooms.
- Turn off power strips when not in use.
- Turn down the heat a few degrees and put on a sweater, or turn off the air conditioner and change into cooler clothes.
- Check your trash for recyclable items and take them out for recycling. If your town does not provide curbside pickup for recyclable items, find out where the nearest community recycling center is.

IN THE FUTURE YOU CAN:

- As your existing lightbulbs burn out, replace them with LED or compact fluorescent lightbulbs.
- Have your car checked to make sure it runs as well as it can and puts out the lowest amount of polluting emissions possible.
- Go online and find one of the many calculators available that can help you estimate your environmental footprint. After calculating your footprint, figure out ways to reduce it.

- The world's population is increasing rapidly, especially in the developing world. Factors that may eventually limit human population are food, availability of land and water, energy, and minimum acceptable standard of living.
- Increased amounts of air pollutants are especially dangerous for children, older adults, and people with chronic health problems.
- Factors contributing to the development of smog include heavy motor vehicle traffic, hot weather, and stagnant air.
- Carbon dioxide and other natural gases act as a greenhouse around the earth, increasing the temperature of the atmosphere. Levels of these gases are rising through human activity; as a result, the world's climate could change.
- The ozone layer that shields the earth's surface from the sun's UV rays has thinned and developed holes in certain regions.
- Environmental damage from energy use can be limited through energy conservation and the development of nonpolluting, renewable sources of energy.
- Indoor pollutants can trigger allergies and illness in the short term and cancer in the long term.
- Concerns with water quality focus on pathogenic organisms and hazardous chemicals from industry and households, as well as on water shortages.

- Sewage treatment prevents pathogens from contaminating drinking water; it often must also deal with heavy metals and hazardous chemicals.
- The amount of garbage is growing all the time; paper is the biggest component. Recycling can help reduce solid waste disposal problems.
- Potentially hazardous chemical pollutants include asbestos, lead, pesticides, mercury, and many household products. Proper handling and disposal are critical.
- Radiation can cause radiation sickness, chromosome damage, and cancer, among other health problems.
- Loud or persistent noise can lead to hearing loss and/or stress; two common sources of excessive noise are the workplace and rock concerts.

FOR MORE INFORMATION

BOOKS

Ausenda, F. 2009. *Green Volunteers: The World Guide to Voluntary Work in Nature Conservation*, 7th ed. New York: Universe. Describes a variety of opportunities to volunteer for environmental causes in many different parts of the world.

Heinberg, R., and D. Lerch (eds.). 2010. *The Post Carbon Reader: Managing the 21st Century's Sustainability Crises*. Healdsburg, CA: Watershed Media. A collection of diverse and provocative articles on pressing environmental problems and what can be done about them.

Maslin, M. 2009. *Global Warming: A Very Short Introduction*, 2nd ed. New York: Oxford University Press. A survey of the science and politics of global warming.

Nadakavukaren, A. 2011. *Our Global Environment: A Health Perspective*, 7th ed. Prospect Heights, IL: Waveland Press. A broad survey of major environmental issues and their effects on personal and community health.

Wright, R. T. 2010. *Environmental Science: Toward a Sustainable Future*. New York: Pearson. An easy-to-read introduction to the realm of environmental science and its importance to our future.

ORGANIZATIONS, HOTLINES, AND WEBSITES

CDC National Center for Environmental Health. Provides brochures and fact sheets about a variety of environmental issues.

<http://www.cdc.gov/nceh/default.htm>

Earth Times. An international online newspaper devoted to global environmental issues.

<http://www.earthtimes.org>

Ecological Footprint. Calculates your personal ecological footprint based on your diet, transportation patterns, and living arrangements.

<http://www.myfootprint.org>

Fuel Economy. Provides information about the fuel economy of cars made since 1985 and tips on improving gas mileage.

<http://www.fueleconomy.gov>

Indoor Air Quality Information Hotline. Answers questions, provides publications, and makes referrals.

800-438-4318

National Lead Information Center. Provides information packets and specialist advice.

<http://www.epa.gov/lead/index.html>

National Oceanic and Atmospheric Administration (NOAA): Climate. Provides information about a variety of issues related to climate, including global warming, drought, and El Niño and La Niña.

<http://www.noaa.gov/climate.html>

National Safety Council Environmental Health Center. Provides information about lead, radon, indoor air quality, hazardous chemicals, and other environmental issues.

http://www.nsc.org/international/env_hth_sty/Pages/EnvironmentalHealthSafety.aspx

Student Environmental Action Coalition (SEAC). A coalition of student and youth environmental groups; the website has contact information for local groups.

<http://www.seac.org>

United Nations. Several U.N. programs are devoted to environmental problems on a global scale; the websites provide information about current and projected trends and about international treaties developed to deal with environmental issues.

<http://www.un.org/popin> (Population Information Network)

<http://www.unep.org> (Environment Programme)

U.S. Department of Energy: Energy Efficiency and Renewable Energy (EERE). Provides information about alternative fuels and tips for saving energy at home and in your car.

<http://www.eere.energy.gov/>

U.S. Environmental Protection Agency (EPA). Provides information about EPA activities and many consumer-oriented materials. The website includes special sites devoted to global warming, ozone loss, pesticides, and other areas of concern.

<http://www.epa.gov>

Worldwatch Institute. A public policy research organization focusing on emerging global environmental problems and the links between the world economy and the environment.

<http://www.worldwatch.org>

There are many national and international organizations working on environmental health problems. A few of the largest and best known are listed below:

Greenpeace: 800-326-0959; <http://www.greenpeace.org>

National Audubon Society: 212-979-3000; <http://www.audubon.org>

National Resources Defense Council: (212) 727-2700; <http://www.nrdc.org>

National Wildlife Federation: 800-822-9919; <http://www.nwf.org>

Nature Conservancy: 800-628-6860; <http://www.nature.org>

Sierra Club: 415-977-5500; <http://www.sierraclub.org>

U.S. Green Building Council: 800-795-1747; <http://www.usgbc.org/>

World Wildlife Fund—U.S.: 800-960-0993; <http://www.worldwildlife.org>

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Conventional and Complementary Medicine

LOOKING AHEAD...

After reading this chapter, you should be able to

- Explain the self-care decision-making process and discuss options for self-treatment
- Describe the basic premises, practices, and providers of conventional medicine
- Describe the basic premises, practices, and providers of complementary and alternative medicine
- Explain how to communicate effectively with health care providers and use their input when evaluating different types of treatment
- Discuss different types of health insurance plans

TEST YOUR KNOWLEDGE

1. The people most likely to use complementary and alternative medicine are those without a conventional primary care physician.
True or false?
2. Which practice or interest is shared by both conventional Western medicine and complementary and alternative medicine?
 - a. Careful observation of symptoms
 - b. Treatment with remedies derived from plants
 - c. Concern with the patient–physician relationship
3. Herbal remedies and dietary supplements like St. John's wort must meet FDA standards for effectiveness before they can be put on the market.
True or false?
4. Generic drugs are generally less effective than brand-name drugs.
True or false?
5. Approximately how many Americans had no health insurance prior to the passage of health care reform legislation in 2010?
 - a. 5 million
 - b. 15 million
 - c. 50 million

ANSWERS

1. **FALSE.** The more often a person visits a conventional primary care physician, the more likely he or she is to use complementary and alternative medicine.
2. **ALL THREE.** Although there are profound philosophical differences between the approaches, they share many characteristics.
3. **FALSE.** Manufacturers are responsible for the safety of the dietary supplements they sell; however, the FDA has the power to restrict a product if it is found to pose a health risk after it is on the market. Manufacturers are not required to prove that their products are effective.
4. **FALSE.** Price is often the only difference. The generic version of a drug has the same active ingredient or combination of ingredients as the brand-name drug, but it may have different inactive ingredients.
5. **C.** About 50 million Americans had no health insurance coverage in early 2010.

Today people are becoming more empowered and confident in their ability to solve personal health problems on their own. People who manage their own health care gather information and learn skills from a variety of resources. They solicit opinions and advice, make decisions, and take action. They know how to practice safe, effective self-care, and they know how to make decisions about professional medical care—whether conventional Western medicine, or complementary and alternative medicine.

This chapter will help you develop skills to identify and manage medical problems and to make the health care system work effectively for you.

SELF-CARE

Effectively managing medical problems involves developing several skills. First, you need to learn to be a good observer of your own body and assess your symptoms. You also must be able to decide when to seek professional advice and when you can safely deal with a problem on your own. You need to know how to safely and effectively self-treat common medical problems. Finally, you need to know how to develop a partnership with physicians and other health care providers and how to carry out treatment plans.

Self-Assessment

Symptoms are often an expression of the body's attempt to heal itself. For example, the pain and swelling that occur after an ankle injury immobilize the injured joint so healing can take place. A fever may be an attempt to inhibit the growth and reproduction of infectious agents. A cough can help clear the airways and protect the lungs. Understanding what a symptom means and what is going on in your body helps reduce anxiety about symptoms and enables you to practice safe self-care that supports your body's own healing mechanisms.

Carefully observing symptoms also helps you identify signals that suggest you need professional help. You should begin by noting when the symptom began, how often and when it occurs, what makes it worse, what makes it better, and whether you have any associated symptoms or illnesses. You can also monitor your body's vital signs, such as temperature and heart rate. Medical self-tests for blood pressure, blood sugar, pregnancy detection, and urinary tract infections can also help you make a more informed decision about when to seek medical help and when to self-treat.

QUICK

STATS

On average, 236 Americans visit a hospital emergency department every minute.

—National Hospital Ambulatory Medical Care Survey: 2008

Knowing When to See a Physician

In general, you should see a physician for symptoms that you would describe as follows:

1. **Severe.** If the symptom is very severe or intense, medical assistance is advised. Examples include severe pains, major injuries, and other emergencies.
2. **Unusual.** If the symptom is peculiar and unfamiliar, it is wise to check it out with your physician. Examples include unexplained lumps, changes in a mole, problems with vision, difficulty swallowing, numbness, weakness, unexplained weight loss, and blood in the sputum, urine, or stool.
3. **Persistent.** If the symptom lasts longer than expected, seek medical advice. Examples in adults include fever for more than five days, a cough lasting longer than two weeks, a sore that doesn't heal within a month, and hoarseness lasting longer than three weeks.
4. **Recurrent.** If a symptom returns again and again, medical evaluation is advised. Examples include recurrent headaches, abdominal pain, and backache.

Sometimes a single symptom is not a cause for concern, but when the symptom is accompanied by other symptoms, the combination suggests a more serious problem. For example, a fever with a stiff neck suggests meningitis.

If you evaluate your symptoms and think that you need professional help, you must decide how urgent the problem is. If it is a true emergency, you should go (or call someone to

take you) to the nearest hospital emergency department. Emergencies include the following:

- Major trauma or injury to the head, a suspected broken bone, deep wound, severe burn, eye injury, or animal bite.
- Uncontrollable bleeding or internal bleeding, as indicated by blood in the sputum, vomit, or stool.
- Intolerable and uncontrollable pain or severe chest pain.
- Severe shortness of breath.
- Persistent abdominal pain, especially if associated with nausea and vomiting.
- Poisoning or drug overdose.
- Loss of consciousness or seizure.
- Stupor, drowsiness, or disorientation that cannot be explained.
- Severe or worsening reaction to an insect bite or sting or to a medication, especially if breathing becomes difficult.

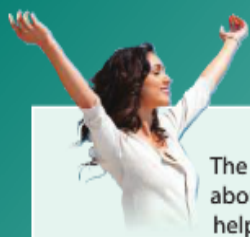
If your problem is not an emergency but still requires medical attention, call your physician's office. Often you can be given medical advice over the phone without needing a visit to the clinic. To help you make wise medical decisions, a "Self-Care Guide for Common Medical Problems" is provided in Appendix B.

Self-Treatment

When confronted with a new symptom, many people try to find some medication that will relieve or cure it. However, other self-treatment options are available.

Watchful Waiting In most cases, your body itself can relieve your symptoms and heal the disorder. The prescriptions filled by your body's internal pharmacy are frequently the safest and most effective treatment, so patience and careful self-observation are often the best choices in self-treatment.

Nondrug Options Nondrug options are often easy, inexpensive, safe, and highly effective. For example, massage, ice packs, and neck exercises may at times be more helpful than drugs in relieving headaches and other pains. Getting adequate rest, increasing exercise, drinking more water, eating more or less of certain foods, using humidifiers, changes in ergonomics when working at a desk, and similar remedies are just some of the hundreds of nondrug options for preventing or relieving many common health problems. For a variety of disorders caused or aggravated by stress, the treatment of choice may be relaxation or other stress management strategies. (See Chapter 2 and this chapter's box "The Health Benefits of Expressive Writing.")



EMBRACING WELLNESS

The Health Benefits of Expressive Writing

The act of writing down feelings and thoughts about stressful life events has been shown to help people improve their health. In one recent study, people with asthma or rheumatoid arthritis were asked to write down their feelings about the most stressful event in their lives. They wrote for 20 minutes a day over a three-day period. In follow-up evaluations four months later, nearly half of those who engaged in expressive writing experienced positive changes in their condition, such as improved lung function or reduced joint pain.

Investigators remain unsure why writing about one's feelings has beneficial effects. It is possible that expressing feelings about a traumatic event helps people work through the event and put it behind them. The resulting sense of release and control may reduce stress levels and have positive physical effects such as reduced heart rate and blood pressure, and improved immune function. Alternatively, expressive writing may change the way people think about previous stressful events in their lives and help them cope with new stressors. Whatever the mechanism, it's clear that expressive writing can be a safe, inexpensive, and effective supplement to standard treatment of certain illnesses.

What about the effects of expressive writing on otherwise healthy individuals? Other studies have, in fact, found a similar benefit: people who wrote about traumatic experiences reported fewer symptoms, fewer days off work, fewer physician visits, improved mood, and a more positive outlook.

If you'd like to try expressive writing to help you deal with a traumatic event, set aside a special time—15 minutes a day for

four consecutive days, for example, or one day a week for four weeks. Write in a place where you won't be interrupted or distracted. Explore your deepest thoughts and feelings and why you feel the way you do. Write as rapidly as possible and don't worry about grammar or coherence or about what someone else might think about what you're writing; you are writing just for yourself.

(Interestingly, writing by hand has been found to produce more beneficial health effects than writing using a keyboard.) You may find the writing exercise to be distressing in the short term—sadness and depression are common when dealing with feelings about a stressful event—but most people report relief and contentment after writing for several days.



Self-Medication Self-treatment with nonprescription medications is an important part of health care. Nonprescription or **over-the-counter (OTC) medications** are medicines that the Food and Drug Administration (FDA) has determined are safe for use without a physician's prescription. There are more than 100,000 OTC drugs on the market; about 60% of all medications are sold over the counter.

Many OTC drugs are highly effective in relieving symptoms and sometimes in curing illnesses. In fact, many OTC drugs were formerly prescription drugs. Hundreds of products sold over the counter today use ingredients or dosage strengths available only by prescription 20 years ago. With this increased consumer choice, however, comes increased consumer responsibility for using OTC drugs safely.

Many ingredients in OTC drugs have not been proven effective, a fact the FDA does not dispute.

Consumers also need to be aware of the barrage of OTC drug advertising aimed at them. The implication of such advertising is that every symptom can and should be relieved by a drug. Although many OTC products are effective, others are unnecessary or divert attention from better ways of coping. Many ingredients in OTC drugs—perhaps 70%—have not been proven to be effective, a fact the FDA does not dispute. And any drug may have risks and side effects.

Follow these simple guidelines to self-medicate safely:

1. Always read labels and follow directions carefully. The information on most OTC drug labels now appears in a standard format developed by the FDA (Figure 20.1). Ingredients, directions for safe use, and warnings are clearly indicated. If you have any question, ask a pharmacist or a qualified health care provider before using a product.
2. Do not exceed the recommended dosage or length of treatment unless you discuss this with your physician.

over-the-counter (OTC) medication A medication or product that can be purchased by the consumer without a prescription.

TERMS

Active ingredients listed with quantity per dose

Uses of product

Absolute contraindications for use

Warnings for people with certain conditions or symptoms

Side effects that could occur and substances and activities to avoid

Warnings related to pregnancy, breastfeeding, and accidental overdose

Additional information

Inactive ingredients

Drug Facts

Active ingredients (in each 5mL)	Purpose
Brompheniramine maleate 2 mg.....	Antihistamine
Dextromethorphan HBr 10mg.....	Cough suppressant
Pseudoephedrine HCl 30 mg.....	Nasal decongestant

Use temporarily relieves:

■ sneezing	■ runny nose	■ nasal congestion	■ cough
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Warnings

Do not use if you are now taking a prescription monoamine oxidase inhibitor (MAOI) (certain drugs for depression, psychiatric or emotional conditions, or Parkinson's disease), or for 2 weeks after stopping the MAOI drug. If you do not know if your prescription drug contains an MAOI, ask a doctor or pharmacist before taking this product.

Ask a doctor before use if you have

■ heart disease	■ glaucoma	■ diabetes	■ thyroid disease
■ cough that occurs with too much phlegm (mucus)	■ high blood pressure		
■ trouble urinating due to an enlarged prostate gland			
■ a breathing problem or chronic cough that lasts or as occurs with smoking, asthma, chronic bronchitis, or emphysema			

Ask a doctor or pharmacist before use if you are taking sedatives or tranquilizers

When using this product

■ drowsiness may occur	■ do not use more than directed
■ alcohol, sedatives, and tranquilizers may increase drowsiness	■ avoid alcoholic drinks
■ be careful when driving a motor vehicle or operating machinery	
■ excitability may occur, especially in children	

Stop use and ask a doctor if

■ cough lasts more than 7 days, comes back, or occurs with fever, rash, or headache that lasts. These could be signs of a serious condition.	■ you get nervous, dizzy, or sleepless
■ symptoms do not get better within 7 days or occur with a fever	

If pregnant or breastfeeding, ask a health professional before use.

Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away.

Directions

■ take every 4 to 6 hours; not more than 4 doses in 24 hours	
adults and children 12 years and over	10 mL
children 6 years to under 12 years	5 mL
children under 6 years	ask a doctor

Other information store at 20-25°C (68-77°F)

Inactive ingredients citric acid, FD&C blue #1, glycerin, propylene glycol, purified water, saccharin, sodium, sodium benzoate, sorbitol

Questions or comments? 123-555-1234

Purpose of each ingredient

Warnings about drug-drug or drug-food interactions

Serious reactions that would require people to stop using the product

Dosage and when, how, and how often to take the product

Phone number to call with questions or comments

FIGURE 20.1 Reading and understanding OTC drug labels.

SOURCE: Food and Drug Administration. 1999. Over-the-counter human drugs: labeling requirements: final rule. *Federal Register* 64(51), 17 March, 13254–13303.

- Use caution if you are taking other medications or supplements because OTC drugs and herbal supplements can interact with some prescription drugs. If you have questions about drug interactions, ask your doctor or pharmacist *before* you take medicines in combination.
- Try to select medications with one active ingredient rather than combination products. A product with multiple ingredients is likely to include drugs for symptoms you don't have. Using single-ingredient products also allows you to adjust the dosage of each medication separately for optimal symptom relief with minimal side effects.
- When choosing medications, try to buy **generic drugs**, which contain the same active ingredient as brand-name products but generally at a much lower cost.
- Never take or give a drug from an unlabeled container or when you can't read the label.
- If you are pregnant or nursing or have a chronic condition such as kidney or liver disease, consult your health care provider before self-medicating.
- The expiration date marked on many medications is an estimate of how long the medication is likely to be safe and effective. However, an extensive study by the FDA found that 90% of all prescription and OTC medications are potent for several years after their stated expiration date. Exceptions include the antibiotic tetracycline, liquid antibiotics, nitroglycerine, and insulin.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Do you often self-medicate for common medical problems, such as headaches or colds? If so, how careful are you about reading product labels and following directions? For example, would you know if you were taking two OTC medications that contained the same ingredient (such as ibuprofen) at the same time?

generic drug A drug that is not registered or protected by a commercial trademark; a drug that does not have an exclusive brand name.

TERMS

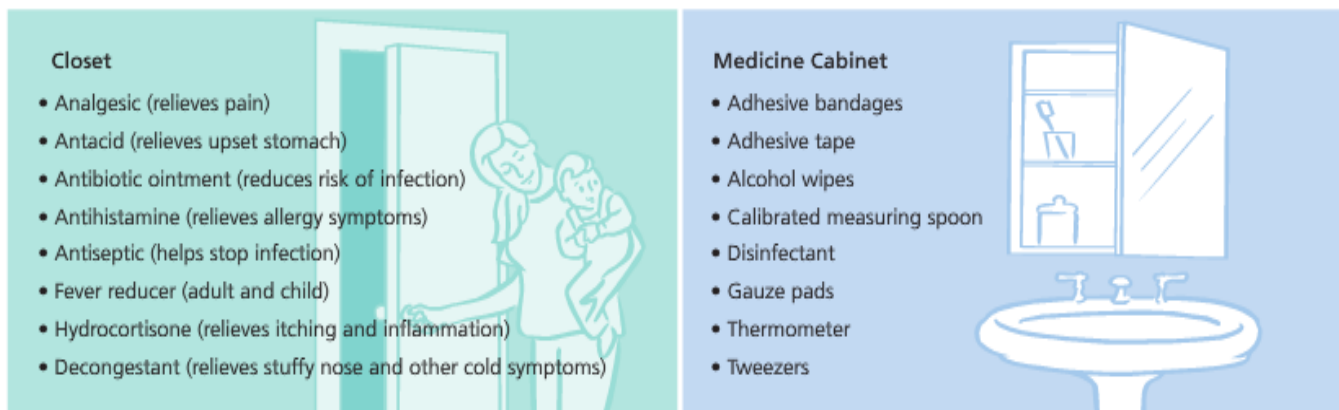


FIGURE 20.2 Your home medical care kit. A cool, dark, and dry place such as the top of a linen closet, preferably in a locked container and out of a child's reach, is best for storing medicines. Showers and baths create heat and humidity that can cause some drugs to deteriorate rapidly. Use your bathroom medicine cabinet for supplies that aren't affected by heat and humidity.

SOURCE: Lewis, C. 2000. Your medicine cabinet needs an annual checkup, too. *FDA Consumer*, March/April.

Expiration dates are very conservative. If a medicine is expired by more than a few years and you need to be certain that the medication is completely effective, you should purchase new medication. You can dispose of old medicine by placing it in a sealed container with coffee grounds or cat litter, but the safest way to get rid of outdated medicines is to take them to a pharmacy or hospital. If you have any question about a medicine's expiration date, ask a pharmacist.

9. Store your medications in a cool, dry place that is out of the reach of children (Figure 20.2).
10. Use special caution with aspirin. Because of an association with a rare but serious problem known as Reye's syndrome, aspirin should not be used by children or adolescents who may have the flu, chicken pox, or any other viral illness. Outdated aspirin that has an acidic odor should be discarded.

PROFESSIONAL CARE

When self-treatment is not appropriate or sufficient, you need to seek professional medical care, whether by going to a hospital emergency department, by scheduling an appointment with your physician, or by accessing some other conventional health care. In recent years many Americans have also sought health care from practitioners of **complementary and alternative medicine (CAM)**—defined as those therapies and practices that do not form part of **conventional medicine**, which is defined as mainstream health care and medical practices taught in most U.S. medical schools and offered in most U.S. hospitals. The most frequently used CAM therapies are nonvitamin, nonmineral natural products; chiropractic care; deep breathing exercises; meditation; massage; and yoga (Table 20.1). Between 2002 and 2007 there was increased use of acupuncture, deep breathing exercises, massage therapy, meditation, naturopathy, and yoga, among others, and an increased use of CAM overall. People

often use CAM therapies in addition to their conventional medical treatments, but most (approximately 72%) do not tell their physicians about it.

The term "CAM" includes both of the terms "complementary" and "alternative." CAM is the term widely used in the United States for safe and possibly effective complementary practices that are used together with (**complementary medicine**) or rather than (**alternative medicine**) conventional practices. For example, when a conventional drug such as penicillin (an antibiotic) is used to fight an infection together with an unconventional remedy such as the herb echinacea (which enhances immunity to an infection), these are considered complementary. However, if an unconventional remedy such as a wrist bracelet (which applies pressure to an acupressure point) is used to prevent motion sickness instead of taking a conventional medication such as Dramamine (a drug used for motion sickness), the wrist bracelet is considered alternative. When an alternative practice is used, it should have a high level of proof that it is safe and as effective as or more effective than a conventional method, especially if the condition being treated or prevented is serious or life-threatening.

complementary and alternative medicine (CAM)

Health care practices and products that are not considered part of conventional, mainstream medical practice as taught in most U.S. medical schools and are not available at most U.S. health care facilities; examples of CAM practices include acupuncture and herbal remedies.

conventional medicine A system of medicine based on the application of the scientific method; diseases are thought to be caused by identifiable physical factors and characterized by a representative set of signs and symptoms; also called *biomedicine* or *standard Western medicine*.

complementary medicine Unconventional medical practices that are used together with conventional ones.

alternative medicine Unconventional medical practices that are used instead of conventional methods.

TERMS

Table 20.1**Use of Complementary and Alternative Therapies by Adults**

	PERCENTAGE WHO USED THERAPY IN LAST 12 MONTHS
Natural products (nonvitamin, nonmineral)	17.7
Chiropractic care	8.6
Deep breathing exercises	12.7
Meditation	9.4
Massage	8.3
Yoga	6.1
Diet-based therapies	3.6
Progressive relaxation	2.9
Acupuncture	1.4
Homeopathic treatment	1.8
Guided imagery	2.2
T'ai chi	1.0
Hypnosis	0.2
Energy healing therapy/Reiki	0.5
Biofeedback	0.2
Any therapy	38.3

SOURCE: Barnes, P. M., et al. 2008. Complementary and alternative medicine use among adults and children: United States, 2007. *CDC National Health Statistics Report #12*. Hyattsville, MD: National Center for Health Statistics.

The term **integrative medicine** is becoming widely accepted by conventional medical providers. It refers to practicing conventional health care (such as internal medicine, physical therapy, or dentistry) with the *addition* of unconventional modalities (such as hypnosis or music for relaxation). The term “integrative medicine” is similar to “CAM” but it differs from CAM in that the integrative medicine practitioner *primarily* practices conventional health care and may *add* unconventional modalities to augment conventional ones.

Consumers turn to CAM for a variety of purposes related to health and well-being, such as boosting their immune systems,

lowering their cholesterol levels, losing weight, quitting smoking, or enhancing their memory. There are indications that people with chronic conditions, including cancer, asthma, autoimmune diseases, and HIV infection, are particularly likely to try CAM therapies. Despite their growing popularity, many CAM practices remain controversial, and consumers need to be critically aware of safety issues. The National Center for Complementary and Alternative Medicine (NCCAM), a branch of the National Institutes of Health (NIH), was established in the 1990s to apply rigorous scientific standards for proving or disproving the safety and effectiveness of CAM.

The following sections examine the principles and providers of both conventional medicine—the dominant medical system in the United States and Europe, also referred to as standard *Western medicine* or *biomedicine*—and complementary and alternative medicine, with particular attention to consumer issues.

CONVENTIONAL MEDICINE

Referring to conventional medicine as “standard Western medicine” draws attention to the fact that it differs from the various medical systems that have developed in China, Japan, India, and other parts of the world. Calling it “biomedicine” reflects conventional medicine’s foundation in the biological and physical sciences.

Premises and Assumptions of Conventional Medicine

One of the important characteristics of Western medicine is the belief that disease is caused by identifiable physical factors. Western medicine identifies the causes of disease as pathogens (such as bacteria and viruses), genetic factors, and unhealthy lifestyles that result in changes at the molecular and cellular levels. In most cases, the focus is primarily on the physical causes of illness rather than mental or spiritual imbalance.

Another feature that distinguishes Western biomedicine from other medical systems is the concept that almost every disease is defined by a certain set of signs (physical manifestations) and symptoms (the effects on an individual), and that they are similar in most patients suffering from the disease. Western medicine tends to treat diseases as biological disturbances occurring in humans, rather than being integral in some way to the individual with the illness.

A disease can be caused by either internal or external factors. Internal factors include anatomic or physiologic abnormalities, and defective genetic, hormonal, and immune mechanisms. External causes include infections by bacteria and viruses, and some cases of traumatic injury. The public health measures of the 19th and 20th centuries—chlorination of drinking water, sewage disposal, food safety regulations, vaccination programs, education about hygiene, and so on—were an outgrowth of this orientation.

The implementation of public health measures is one way to control disease; others include preventive lifestyle measures

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What are your views about the use of CAM treatments and therapies? What events or information have shaped those views? Would you consider using complementary or alternative medicine?

Integrative medicine Conventional health care practice that is sometimes augmented by unconventional (CAM) modalities.

TERMS



Conventional Western medicine is grounded in scientific explanations resulting from the application of the scientific method or through observable outcomes in randomized controlled studies.

and the use of drugs and surgery. The discovery and development of sulfa drugs, antibiotics, and steroids in the 20th century, along with advances in chemistry that made it possible to identify the active ingredients in common plant-derived remedies, paved the way for the current close identification of Western medicine with **pharmaceuticals** (medical drugs, both prescription and over-the-counter). Western medicine also relies heavily on surgery and on advanced medical technology to discover a physical cause of an individual's disease and to correct, remove, or destroy it.

Further, Western medicine is based on the scientific method of obtaining knowledge and explaining health-related phenomena using scientific explanations that have these characteristics:

- **Empirical**—they are based on the evidence of the senses and on objective and systematic observation, often carried out under carefully controlled conditions; they

must be capable of verification by other observers or through the use of technology (such as lab tests and physical measurement, such as blood pressure).

- **Rational**—they follow the rules of logic and are consistent with known facts.
- **Testable**—either they are verifiable through direct observation or they lead to predictions about what should occur under conditions not yet observed.
- **Parsimonious**—they explain phenomena with the fewest causes.
- **General**—they have broad explanatory power.
- **Rigorously evaluated**—they are constantly evaluated for consistency with the evidence and known principles, for parsimony, and for generality.
- **Tentative**—scientists are willing to entertain the possibility that their explanations are faulty, based on new, better, or connected evidence.

The scientific method is both a way of acquiring knowledge and a way of thinking that involves approaching a problem by carefully defining its parameters, seeking relevant evidence, and subjecting proposed solutions to rigorous testing.

Western medicine uses the scientific method in health care practice by applying the research process, a highly refined and well-established approach to exploring the causes of disease and ensuring the safety and efficacy of treatments. Research ranges from case studies—descriptions of a single patient's illness and treatment—to randomized controlled trials (RCTs) conducted on large populations; RCTs are considered the highest level of scientific medical research.

The process of drug development is equally rigorous. Drugs are developed and tested through an elaborate course that begins with preliminary research in the lab and continues through trials with human participants, review and approval by the FDA, and monitoring of the drug's effects even after it is on the market. The process may take 12 years or more, and only about 20% of drugs are eventually approved for marketing.

When results of research studies are published in medical journals, a community of scientists, physicians, researchers, and scholars has the opportunity to share the findings and enter a dialogue about the subject. Publication of research often prompts further research designed to replicate and confirm the findings, challenge the conclusions, or pursue related lines of thought or experimentation. (For guidelines on how to interpret research when it is reported in the popular press, see the box "Evaluating Health News.")

Pharmaceuticals and the Placebo Effect

A placebo is a chemically inactive substance that a patient believes is an effective therapy for his or her condition. (For procedures that don't involve drugs, such as surgery

pharmaceuticals Medical drugs, both prescription and over-the-counter.

TERMS

TAKE CHARGE

Evaluating Health News



Health-related research published in scientific medical journals is often summarized for the public in the popular media, which may oversimplify, exaggerate, or sensationalize the results. The following questions can help you evaluate scientific health advice presented in popular media:

1. *Is the report based on scientific studies?* Information or advice based on carefully designed research studies has more validity than casual observations.
2. *What is the source of the information?* A study published in a respected peer-reviewed scientific journal has been examined by editors and researchers who are professionally prepared to evaluate the merits of a study and its results and its application to actual patients. Most journals include information on the funding source and the authors' affiliations that may introduce a bias or conflict of interest. Studies sponsored by drug companies or other commercial groups are suspect; information from universities, government agencies, and national research organizations is usually considered more reliable.
3. *How many subjects were included in the study?* A study involving many subjects is more likely to yield reliable results than a study involving only a few subjects. Most quality studies include a "statistical power analysis" section that specifies how many subjects were necessary. Too few subjects are suspect; too many subjects above the number specified in the power analysis may inflate the practical usefulness of the results even though "statistical significance" (usually a p-value less than or equal to 0.05 or 5%) was achieved.
4. *Who were the subjects?* Research findings are more likely to apply to you if you share important characteristics with the participants in the study.
5. *What kind of study was it?* Randomized controlled trials and meta-analyses are considered the most valid. Epidemiological studies (which involve noncontrolled observations) may suggest useful information, but they cannot always establish

cause-and-effect relationships. Consider the following when deciding whether a study's results should be considered significant:

- *Were the treatment group results compared to a control group?*
 - *Were the subjects randomly assigned to the treatment and control groups?*
 - *Was the study double-blinded?*
 - *Was it a multicenter study?* A few randomized controlled trials are multicenter studies. A meta-analysis combines and recalculates data from several similar studies conducted in different locations by different researchers. A well-conducted meta-analysis is considered one of the most valid study designs.
6. *What do the statistics really say?* Are the results statistically significant (meaning there is a 5% or lower chance that the findings resulted from chance)? Does the study have the required number of subjects according to a statistical power analysis? Some studies report the effect size instead of or in addition to a p-value. Most of the time the effect size is more revealing than the p-value.
 7. *Is new health advice being offered?* If the media report new guidelines for health behavior or medical treatment, examine the source. Be suspicious of absolutes and overstated words such as "certainty," "always," and "never." Scientifically accurate reports use words such as "results show," "for many people," and "the evidence suggests." Reliable information sources should present the limitations of a study's results and consider a great deal of evidence before offering health advice. Above all, use common sense, and check with your physician before making a major change in your health habits based on news reports.

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or acupuncture, a *sham* procedure is used.) Controlled research studies typically use placebos or a sham procedure for control subjects in experiments testing the efficacy of a particular drug or other treatment. By comparing the effects of the actual treatment with the effects of the placebo or sham, researchers can judge whether the treatment is effective.

The *placebo effect* occurs when a patient improves after receiving a placebo. In such cases, the effect of the placebo on the patient cannot be attributed to the specific actions or properties of the drug or procedure.

Researchers have consistently found that 30–40% of all patients given a placebo show improvement. This result has been observed for a wide variety of conditions or symptoms, including coughing, seasickness, depression, migraines, and

angina. For certain conditions, placebos have been effective in up to 70% of patients. In some cases, people given a placebo even report having the side effects associated with an actual drug. Placebos are particularly effective when they are administered by a practitioner whom the patient likes and believes in. Placebos that are thought to be expensive are more effective than an identical "cheap" placebo, and placebos administered by injection are more effective than ones taken orally.

A clear demonstration of the placebo effect occurred in a recent study that examined the effectiveness of a drug used to treat benign enlargement of the prostate. The men who participated in the study were randomly assigned to one of two groups: one group received the medication while the other received a placebo. More than half the men who received the placebo pills reported significant relief from



their symptoms, including faster urine flow—despite the fact that these men actually had an *increase* in the size of their prostates.

Why did the men in the study experience fewer symptoms despite no actual improvement in their condition? Researchers hypothesize that the patients' positive expectations of the medication's effects may have resulted in changes in nerve activity and muscle relaxation affecting the bladder, prostate, and urethra.

Studies of people with depression or Parkinson's disease have found that treatment with an inactive placebo results in documented changes in brain function. These changes in the electrical or chemical activity of the brain may help explain the placebo effect.

In research, the placebo effect is used to evaluate and control for the added benefit of a physiologically active treatment. However, the placebo effect can be exploited by unscrupulous people who sell worthless medical treatments to the scientifically unsophisticated public. But the benefits of placebos can also be harnessed for their beneficial effects. When a skilled and compassionate medical practitioner administers a proven-effective treatment while providing the patient with a sense of confidence and hope, the positive aspects of the placebo effect can add to the benefits of the treatment. Getting well, like getting sick, is a complex process. Anatomy, physiology, emotions, hope, beliefs, and expectations all contribute to the way the body reacts to medical treatments and utilizes its own healing mechanisms.

The Providers of Conventional Medicine

Conventional medicine is practiced by a wide range of health care professionals in the United States. Several kinds

of professionals are permitted to practice specific fields of medicine independently, including medical doctors, osteopaths, podiatrists, optometrists, and dentists.

- **Medical doctors** are practitioners who hold a doctor of medicine (MD) degree from an accredited medical school. With proper postgraduate education, they are licensed to practice a wide range of medical or surgical specialties such as family medicine, internal medicine, orthopedics, ophthalmology, pathology, and others. They are commonly called “allopathic” physicians because of their treatment philosophy and to differentiate them from “osteopathic” physicians. In the United States, an education in medicine has several stages: premedical education in a college or university to earn a bachelor's degree; usually four years of medical school, which teaches basic medical skills and awards the MD degree; and three to eight years of graduate medical study that includes a residency and possibly a specialty fellowship. The American Board of Medical Specialties currently recognizes and approves over 150 different medical specialties and subspecialties.

- **Doctors of osteopathic medicine (DO)** receive postgraduate degrees through residency and fellowship education similar to that of allopathic medical doctors over a comparable timeframe. Osteopathic education emphasizes structural and functional relationships and a whole-person approach to medicine. Like allopathic physicians, osteopathic physicians practice in all of the medical and surgical specialties and subspecialties, but osteopathic physicians may also practice and specialize in osteopathic manipulative therapy (OMT). MDs and DOs often complete their postgraduate education in the same hospitals and medical centers.

- **Podiatrists** are practitioners who specialize in the medical and surgical care of the feet. They hold a doctor of podiatric medicine (DPM) degree. The length of training is similar to that of MDs and DOs. They can prescribe drugs and perform surgery on the feet.

- **Optometrists** are practitioners trained to examine the eyes, detect eye diseases, and treat certain vision problems most often through the use of corrective lenses. They hold a doctor of

medical doctor An independent practitioner who holds a doctor of medicine degree (MD) from an accredited medical school; an allopathic physician.

TERMS

doctor of osteopathic medicine An independent medical practitioner (DO) who has graduated from an osteopathic medical school; osteopathy incorporates the theories and practices of scientific medicine and includes osteopathic manual therapy.

podiatrist A practitioner who holds a doctor of podiatric medicine degree (DPM) and specializes in the medical and surgical care of the feet.

optometrist A practitioner who holds a doctor of optometry degree (OD) and is trained to examine the eyes, detect eye diseases, and prescribe corrective lenses.



In Western medicine, treatment is usually provided by a team of health care professionals, often with different areas of specialization but with shared ideas and beliefs about the causes of illness.

optometry (OD) degree. All states permit optometrists to use certain drugs for diagnostic purposes, and most permit them to use drugs to treat minor eye problems. (*Ophthalmologists* have a MD or DO degree and served a residency or fellowship specializing in diseases of the eye. They care for all types of eye problems using drugs and can perform eye surgery.)

- **Dentists** focus on the care of the teeth and mouth. They are graduates of four-year dental schools and hold the doctor of dental surgery (DDS) or doctor of medical dentistry (DMD) degree; dental specialists such as oral surgeons and orthodontists receive additional education. Dentists can perform surgery and prescribe drugs within the scope of their training.

In addition to these practitioners, there are millions of other highly educated health care professionals. They include nursing professionals such as registered nurses (RNs), nurse

practitioners (NPs), certified registered nurse anesthetists (CRNAs), and certified nurse midwives (CNM). **Allied health care providers** include physician assistants (PAs), physical therapists (PTs or DPTs), pharmacists (PPhs or PharmDs), medical social workers (MSWs), and registered dietitians (RDs).

Choosing a Primary Care Physician

Most experts believe it is best to have a primary care physician (PCP) who gets to know you, coordinates your medical care, and refers you to specialists when you need them. Some health care insurance plans require you to identify a PCP. The primary care disciplines include family practice, internal medicine, pediatrics, and gynecology. These physicians are able to diagnose and treat the vast majority of common health problems and provide many preventive health services. The best time to look for a physician is before you are sick.

To select a physician, begin by making a list of possible choices. If your insurance limits the health care providers you can see, check the plan's list first. Student health services or health maintenance organizations (discussed later) may assign you a physician. If your health plan lets you choose a physician, ask for recommendations from family, friends, coworkers, local medical societies, and the physician referral service at a local clinic or hospital. If you know an allied health provider or nurse, they can be excellent resources for choosing a physician. Some clinics provide brief biographies of physicians on staff who are taking new patients. If you have a particular health problem, you may want to identify physicians who are board-certified in appropriate specialties. Once you have a list of possible physicians, find out if a consumer or other independent group has rated doctors in your area; this will help you check on the quality of care they provide.

Once you have the names of a few physicians you might want to try, call their offices to find out information such as the following:

- Is the physician covered by your health plan and accepting new patients?
- What are the office hours, and when is the physician or office staff available? What do patients do if they need urgent care or have an emergency?
- Which hospitals does the physician use?

QUICK STATS

Nearly 7 million health care professionals of all types work in the United States.

—U.S. Bureau of Labor Statistics, 2010

dentist A practitioner who holds a doctor of medical dentistry (DMD) or doctor of dental surgery degree (DDS) and who specializes in the prevention and treatment of diseases and injuries of the teeth, mouth, and jaws.

allied health care providers Health care professionals who typically provide services with the supervision or control of independent practitioners.

TERMS



DIVERSITY MATTERS

Health Care Visits and Gender

Females are more likely than males to visit a health care provider. Women aged 18–44 make nearly twice as many physician visits as do men. Women are also more likely to report use of complementary and alternative therapies.

What are some of the factors underlying this difference? Reproductive health care needs may be one key factor, with women making doctor visits related to prenatal care and childbirth. Women of reproductive age may also need to make

health care visits to obtain prescription contraceptives and have the pelvic exams and Pap tests required. Even when physician visits related to reproductive care are discounted, however, women are more likely than men to see a health care provider, especially for preventive care.

Male gender roles may be a factor in this trend, with men socialized to be strong and tough, to ignore pain or symptoms of illness, or to feel that physician visits for preventive care (when no symp-

toms are present) are unnecessary. And without preventive care visits, men may be unaware of asymptomatic conditions such as high cholesterol levels or high blood pressure.

At all ages, it is important for both men and women to get recommended health care screenings and immunizations. Preventive care throughout life is important to maximize wellness. Regardless of gender, don't wait until you're ill before you see a physician.

- How many other physicians are available to cover when he or she isn't available, and who are they?
- How long does it usually take to get a routine appointment?
- Does the office send reminders about preventive services and tests such as Pap tests?
- Does the physician (or a nurse or physician assistant) give advice online or over the phone for common problems and continued care of a diagnosed problem?

Schedule a visit with the physician you think you would most like to use. During that first visit, you'll get a sense of how well matched you are and how well he or she might meet your medical needs.

Getting the Most Out of Your Medical Care

The key to making the health care system work for you lies in good communication with your physician and other members of the health care team. Studies show that patients who interact more with physicians and ask more questions enjoy better health outcomes.

The Physician–Patient Partnership The physician–patient relationship is undergoing an important transformation. The image of the all-knowing physician and the passive patient is fading. What is emerging is a physician–patient *partnership* in which the physician acts more like a consultant and the patient participates more actively (see the box “Creating Your Own Health Record”). You should expect your physician to be attentive, caring, and able to listen and clearly explain health care matters to you. You also must do your part. You need to be assertive in a firm but nonaggressive manner. You need to express your feelings and concerns, ask questions and, if

necessary, be persistent. If your physician is unable to communicate clearly with you despite your best efforts, you probably need to change physicians.

Your Physician Appointments Physicians are often pressed for time, so prepare in advance for any office visit. Even well-informed, proactive patients often forget important information and questions during the dynamics of an office visit, so it is recommended that you write down your key concerns and questions, along with notes about your symptoms (when they started, how long they last, what makes them better or worse, what treatments you have already tried, and so on). If you're uncomfortable asking certain questions, practice discussing them ahead of time. Bring a list of all the medications you're taking—prescription, nonprescription, and herbal. Also bring any medical records or test results your physician may not already have.

Present your concerns at the beginning of the visit to set the agenda. Be specific and concise about your symptoms, and be open and honest about your concerns. Share your hunches with your physician—your guesses can provide vital clues. Ask questions if you don't understand something he or she says to you. Let your physician know if you are taking any drugs, are allergic to any medications, are breast-feeding, or may be pregnant.

At the end of the visit, briefly repeat the physician's diagnosis, prognosis, and instructions to make sure you understand your next steps, such as making another appointment, phoning for test results, watching for new symptoms, and so on.

The Diagnostic Process The first step in the diagnostic process is the medical history, which includes your primary reason for the visit, your current symptoms, your past medical history, and your social history (job, family life, major stressors, living conditions, and health habits). Keeping

The image of the all-knowing physician and the passive patient is fading. What is emerging is a physician–patient partnership.

WELLNESS ON CAMPUS

Creating Your Own Health Record



Many Americans believe that their medical records are compiled and maintained by some mysterious entity (probably called “them”). But this is not the case. We each need to be responsible for compiling our important medical records and keeping them safe and easily available to us or a caretaker in case we need the records for an emergency, or when traveling, moving or looking for a new primary care provider. The expanding use of computerized medical records may be useful within a particular clinic or health care system, but this does not mean that every person’s individual medical history has been automatically collated into a single, easy-to-find source. Computerized health records maintained by one hospital or medical care system might not be accessible by another. Ultimately each individual is responsible for keeping track of her or his own health history and records. College is a good time to start doing this for yourself, and by sharing your health knowledge and assisting family members to do the same, you are playing a more active role in your family’s health care.

Personal health records should be readily accessible in case of an emergency. There are some personal computerized health record systems that can be purchased online, or one can be devised individually. Whether purchased or created individually, at a minimum, a personal health record should contain the following information:

- Your name, emergency contact, birth date, blood type, religious preference (if any), and the date this record was compiled or updated.
- All known allergies (including medications).
- A list of all chronic conditions and the date of their diagnosis (diabetes, high blood pressure, asthma, emphysema, etc.)
- Any hereditary diseases.
- The names and dosages of all medications you are taking and reasons for taking them.
- The dates and reasons for all past hospitalizations and operations. If the reasons were serious or may affect future treatments (for example, major organ involvement, surgical prostheses), a hospital discharge summary should be included.
- The date of physical exams and any major findings.
- Vaccination schedules.



- A print-out of all laboratory test results, and a written report of any imaging studies (X-rays, CAT scans, MRIs, etc.), electrocardiograms (ECGs), and special tests such as audiograms and exercise stress tests. Check to verify that dates are included.

Although you have the right to all of your medical records, you might not have access to them if your doctor’s office is closed. You may view or request a copy of your medical records or only a summary of the information. To request copies, you should ask for an “authorization for the release of information form.” Any fee should include only the cost of copying and postage (if you request mailing). If after receiving your medical record you believe any information about you is incorrect or incomplete, you can request an amendment through your physician or a medical information professional, and you have the right for your amendment to be permanently included in your record.

SOURCES: MedlinePlus. *Personal Health Records* (www.nlm.nih.gov/medlineplus/personalhealthrecords.html); AHIMA Foundation. *myPHR* (www.myphr.com).

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up-to-date records of your medical history can help you provide your physician with key facts about your health.

The next step is the physical exam, which usually begins with a review of vital signs: blood pressure, heart rate (pulse), breathing rate, and temperature. Depending on your primary complaint, your physician may give you a complete physical, or the exam may be directed to specific areas, such as your ears, nose, and throat.

Additionally, your physician may order medical tests to complete the diagnosis. Diagnostic testing provides a wealth of information to help solve medical problems. Physicians

can order imaging studies (such as X-rays, MRIs, or CAT scans), biopsies, blood and urine tests, and **endoscopies** to view, probe, or analyze almost any part of the body.

If your physician orders a test for you, be sure you know why you need it, what the risks and benefits of the test are for

endoscopy A medical procedure in which a viewing instrument is inserted into a body cavity or opening.

TERMS

you, how you should prepare for it (for example, by fasting or discontinuing medications or herbal remedies), and what the test will involve. Also ask what the test results mean because no test is 100% accurate—**false positives** and **false negatives** can occur—and interpretation of some tests is subjective. Sometimes it is important to get a second opinion on a diagnosis.

Medical and Surgical Treatments Many conditions can be treated in a variety of ways; in some cases, lifestyle changes are sufficient. When starting any treatment, make sure you know the possible risks and side effects of each treatment option, as well as the likelihood that it will improve your condition.

PRESCRIPTION MEDICATIONS Each month, between 40% and 50% of Americans use at least one prescription medication. Among those 65 and older, between 80% and 90% use prescription drugs. Thousands of lives are saved each year by antibiotics, insulin, and other drugs, but we pay a price for having such powerful tools. A report from the Institute of Medicine (IOM) estimates that 1.5 million prescription drug-related errors—called *adverse drug events*, or ADEs—occur each year in the United States. ADEs happen for several reasons:

- **Medication errors:** Physicians may overprescribe drugs, sometimes in response to pressure by patients. Adverse drug effects (ADEs) can occur if a physician prescribes the wrong drug or a dangerous combination of drugs. Such problems are especially prevalent among older adults, who typically take multiple medications. The risk of ADEs increases greatly with the number of medicines you take. At the pharmacy, patients may receive the wrong drug or may not be given complete information about drug risks, side effects, and interactions. Problems can occur because of a physician's poor handwriting, misinterpretation of an abbreviated drug name, or similarities between the names and packaging of different drugs.

- **Off-label drug use:** Another potential problem is off-label use of drugs. Once a drug is approved by the FDA for one purpose, it can legally be prescribed (although not marketed) for purposes not listed on the label. A recent study revealed that about 20% of medications are prescribed for off-label use; three-quarters of those prescriptions are made with little or no evidence supporting such use. Many off-label uses are safe and supported by some research, but both consumers and health care providers need to take special care with off-label use of medications.

- **Online pharmacies:** Although convenient, some online pharmacies may sell products or engage in practices that are illegal in the offline world, putting consumers at risk for receiving adulterated, expired, ineffective, or counterfeit drugs. The FDA recommends that consumers avoid sites that prescribe drugs for the first time without a physical exam, sell prescription drugs without a prescription, or sell medications not approved by the FDA. You should also avoid sites that do not provide access to a

registered pharmacist to answer questions or that do not provide a U.S. address and phone number to contact if there's a problem. The National Association of Boards of Pharmacy sponsors a voluntary certification program for Internet pharmacies. To be certified, a pharmacy must have a state license and allow regular inspections. Many experts recommend that consumers use online pharmacies only to obtain medicines prescribed by their usual health care providers.

- **Costs:** Spending on prescription drugs is rising faster than the rate of inflation and is now the fastest-growing portion of U.S. health care spending. Many Americans have no or limited insurance coverage for prescription drug costs. Consumers may be able to lower their drug costs by using generic versions of medications; by joining a drug discount program sponsored by a company, organization, or local pharmacy; and by investigating mail-order or Internet pharmacies.

There is ongoing controversy about the importation of lower-cost drugs from Canada. Canada imports U.S. drugs and regulates Canadian-produced drugs, so safety should theoretically not be a concern for drugs from Canada. However, companies in Canada may make drugs for export only, thus avoiding regulation, and online pharmacies may claim they are operating in Canada but may be located in another country where there is little or no regulation. U.S. regulators have found online sites advertising Canadian drugs but shipping fake or substandard versions of medications. In addition, shipping costs can be high, and U.S. generic drugs are often less expensive than Canadian drugs.

Patients share responsibility for their use of prescription drugs. Many people don't take their medications properly, skipping doses, taking incorrect doses, stopping too soon, or not taking the medication at all. An estimated 30–50% of the more than 3 billion prescriptions dispensed annually in the United States are not taken correctly and thus do not produce the desired results. Consumers can increase the safety and effectiveness of their treatment by carefully reading any prescription's label (Figure 20.3) and fact sheets or brochures that come with the medication. Whenever a health care provider gives you a prescription, ask the following questions:

- Are there nondrug alternatives?
- What is the name of the medication, and what is it supposed to do, within what period of time?
- Can I take a generic drug rather than a brand-name one?
- Is there written information about the medication?

QUICK

STATS

Americans spend more than **\$200 billion** each year on prescription drugs.

—CDC, 2010

false positive A test result that incorrectly detects a disorder or condition in a person who does not have the disorder or condition.

false negative A test result that fails to correctly detect a disease or condition.

TERMS

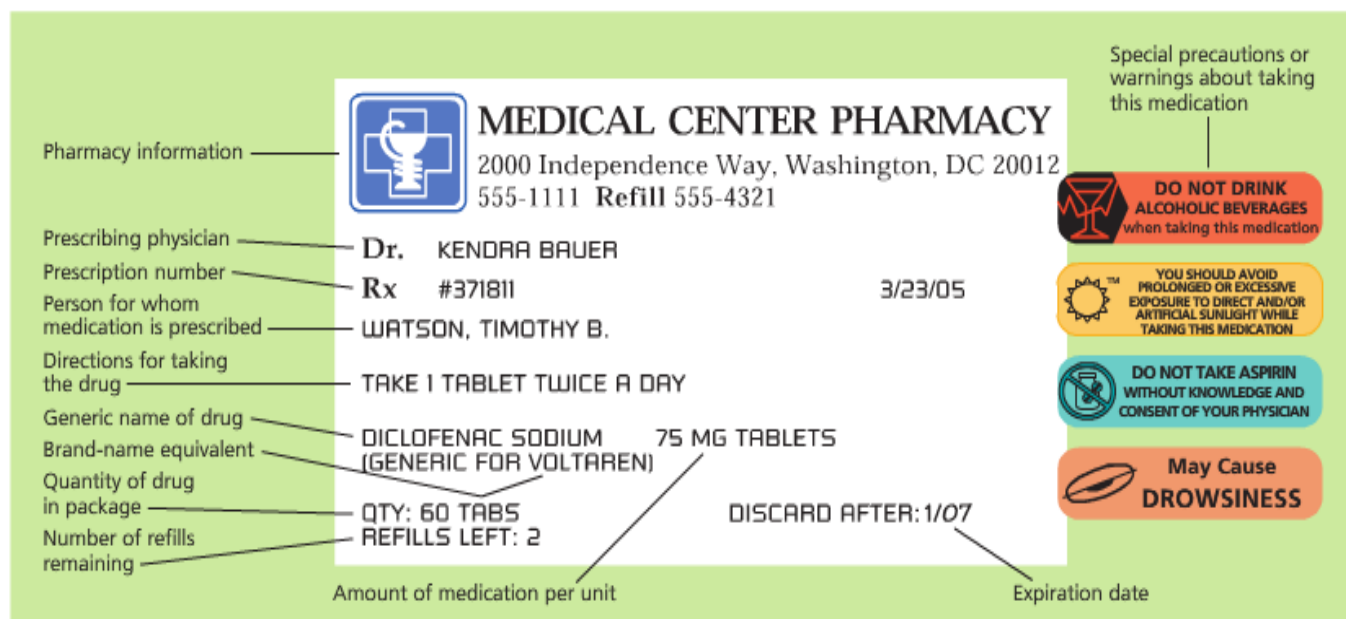


FIGURE 20.3 Reading and understanding prescription medication labels.

If written information is provided, check it for the following information:

- How and when do I take the medication, how much do I take, and for how long? What should I do if I miss a dose?
- What medications, foods, drinks, or activities should I avoid when taking this drug?
- What are the side effects, and what do I do if they occur?

Remember to store your medications in a cool, dry place, out of direct light. Never share your prescription medications with anyone else, and never use an old prescription for a new ailment.

SURGERY Surgical procedures are performed more often in the United States than anywhere else in the world. Each year more than 70 million operations and related procedures are performed. About 20% are in response to an emergency such as a severe injury, and 80% are **elective surgeries**, meaning the patient can generally choose when and where to have the operation, if at all. Many elective surgeries can be done on an **outpatient** basis, so the patient does not have to be admitted to a hospital for the procedure.

If a health care provider suggests surgery for any reason, ask the following questions:

- Why do I need surgery at this time?
- Are any nonsurgical options available, such as medicine or physical therapy?
- What are the risks and complications of the surgery?
- Can the operation be done on an outpatient basis?
- What can I expect before, during, and after surgery?

COMPLEMENTARY AND ALTERNATIVE MEDICINE

Whereas conventional Western medicine tends to focus on the body, on the physical causes of disease, and on ways to eradicate pathogens in order to restore health, CAM tends to focus on an integration of mind, body, and spirit in seeking ways to restore the whole person to harmony so that he or she can regain health. This integration is referred to as **holistic health care**—considering the whole person as a mind–body–spirit entity when diagnosing, treating, or preventing

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What sort of relationship do you have with your primary physician? Do you think he or she understands your needs and is familiar enough with your history? Are you satisfied with this relationship?

elective surgery A nonemergency operation that the patient can choose to schedule.

outpatient A person receiving medical attention without being admitted to the hospital.

holistic health care Practice that takes into account the whole person—body, mind, and spirit—when assessing, treating, and preventing illnesses and maintaining health.

TERMS

any illness or disorder or promoting or maintaining health. The opposite of *holistic* is *dualistic*, which refers to treating the mind and body separately. Under dualism, it is believed that treating an individual's physical body is separate and different from treating an individual's spiritual or mental state. Under holistic approaches, health is not achieved if the mental state is ignored, if the individual is spiritually isolated, or if the body has a disease; holistic health means that the needs of the body, mind, and spirit are balanced and in harmony.

Many alternative medical systems with long-standing traditions have concepts and theories of medicine that once were very different from those of conventional Western medical thought. Some people consider all of CAM quackery and tell you that you can recognize a quack by his or her use of pseudoscientific language. However, the use of phrases like "bringing into harmony with nature" or "enhancing the flow of vital energy" does not necessarily mean that a practitioner is a quack; rather, it may reflect this practitioner's different concept of health and healing.

Anecdotes and testimonials are not adequate levels of evidence when it comes to your health. Case reports alone are not sufficient to scientifically prove the effectiveness of a medical treatment. Caution is in order when choosing any mode of treatment—conventional or unconventional—that has not been scientifically evaluated for safety and effectiveness (see the box "Avoiding Health Fraud and Quackery"). Even though the mechanism of action for CAM modalities is often not known, which is often the case for conventional modalities as well, the standard of proof for safety and efficacy is the randomized controlled trial (RCT). Outcome studies, in which human trials are used to systematically test how people respond, are used extensively in research on conventional and unconventional modalities alike. The NCCAM, some other governmental agencies, national foundations, and universities are sponsoring numerous outcome studies on CAM interventions.

NCCAM groups CAM practices into several broad categories: alternative medical systems, mind–body medicine, natural products, manipulative and body-based practices, and other CAM practices (Figure 20.4). It is impossible to discuss all of these forms fully in a single chapter. Instead what follows is a general introduction to the types of CAM available and a brief description of some of the more widely used ones.

When Does CAM Become Conventional Medicine?

From a Western point of view, when ancient American Indian healers used the foxglove plant for medicinal purposes, it could be considered "alternative"—or even superstition. But when the plant's content, digitalis, was scientifically shown to be a useful pharmaceutical, it became a conventional medical treatment modality for the treatment of heart disease. Because of modern research sponsored mostly by the National Institutes of Health, we are seeing a number of therapeutic alternatives become mainstream medicine.

CAM therapies are slowly but steadily gaining momentum in the United States as



Acupuncture involves the insertion of needles at appropriate points in the skin to restore balance to the flow of qi.

new evidence emerges about the potential value of certain practices, and both consumers and health care professionals are taking notice. According to the National Institutes of Health, in 2007 approximately 38 percent of adults (about 4 in 10) and approximately 12 percent of children (about 1 in 9) used some form of CAM either in conjunction with or instead of standard Western health care. People of all backgrounds use CAM; however, use by adults is greater among women and those with higher levels of education and higher incomes. More than 42 percent of hospitals offer one or more CAM

therapies, and 40 major American universities have added integrative medical centers to their facilities. In addition, nearly all medical schools have curricular offerings on integrative therapies. Although research studies on CAM modalities have been relatively small in size and conservative in their conclusions, some of their results are promising.

Tai Chi and Fibromyalgia A once mysterious and misunderstood disorder, fibromyalgia causes chronic pain throughout the body and general fatigue. It can be partially

The World Health Organization lists more than 40 conditions that may benefit from acupuncture treatment.

CRITICAL CONSUMER

Avoiding Health Fraud and Quackery



According to the Federal Trade Commission, consumers waste billions of dollars on unproven, fraudulently marketed, and sometimes useless health care products and treatments. In addition, individuals with serious medical problems may waste valuable time before seeking proper treatment. Worse yet, some of the products they're buying and using may cause serious harm.

Health fraud is a business that sells false hope. It targets people with diseases that have no medical cure, and people who want shortcuts to improved health, weight loss, or enhanced personal appearance.

To help check out a product, talk to a physician or other licensed health professional who is well-versed in and impartial about CAM modalities. Be wary of treatments offered by people who advise you to avoid talking to others. Check with the Better Business Bureau or local attorney general's office to see if other consumers have lodged complaints about a product or a product's marketer. You can also check with the appropriate health professional group such as the American Diabetes Association, American Cancer Society, or the National Arthritis Foundation. Take special care with products and devices sold on television or online; the broad reach of the Internet, combined with the ease of setting up and removing websites, makes online sellers particularly difficult to regulate.

If you think you have been a victim of health fraud or if you have an adverse reaction that you think is related to a

particular supplement, you can report it to the appropriate agency:

- **False advertising claims:** Contact the FTC by phone (877-FTC-HELP), by mail (Consumer Response Center, Federal Trade Commission, Washington, DC 20580), or online (<http://www.ftc.gov>). You can also contact your state attorney general's office, your state department of health, or the local consumer protection agency (check your local telephone directory).
- **False labeling on a product:** Contact the FDA district office consumer complaint coordinator for your geographic area. The FDA regulates safety, manufacturing, and product labeling.
- **Adverse reaction to a supplement:** If a health risk appears serious, call your physician immediately or go to an emergency clinic. You can also report your adverse reaction to FDA MedWatch by calling 800-FDA-1088 or by visiting the MedWatch website (<http://www.fda.gov/medwatch>).
- **Unlawful Internet sales:** If you find a website that you think is misrepresenting or illegally selling drugs, medical devices, dietary supplements, or cosmetics, report it to the FDA. Problems can be reported to MedWatch or via the FDA website (<http://www.fda.gov/oc/buyonline/buyonlineform.htm>).

treated with drugs, but exercise is an important component of fibromyalgia therapy because it helps maintain or improve muscle strength and function.

Tai chi has long been known to offer many benefits, including gains in strength, flexibility, and stamina, and now it has been shown to be helpful in pain management. A 2010 study published in the *New England Journal of Medicine* tracked the symptoms of two groups of fibromyalgia patients: one that learned a variety of tai chi movements and another that practiced stretching exercises and received wellness counseling. Over the course of the study, the patients who practiced tai chi reported significantly less pain than the other group, and the benefits lasted well beyond the study's end.

In another 2010 study, researchers undertook a comprehensive review of existing studies involving tai chi and qigong (a similar energy practice) to determine whether evidence consistently supported claims that the two practices yield health benefits. In more than 60 studies involving nearly 6500 participants, both tai chi and qigong appeared to enhance cardiorespiratory health, bone health, balance, and overall quality of life. The researchers concluded that tai chi and qigong may be excellent alternatives to conventional forms of exercise for some people.

CAM Therapies and Back Pain CAM therapies are used more often to treat back pain than for any other condition. A 2010 study showed that about 6% of adult Americans who

suffer back pain have tried at least one form of alternative therapy in the hope of finding relief. The therapies most commonly used for back pain are chiropractic, massage, yoga, tai chi, qigong, and acupuncture. In this study, more than 50% of respondents said they elected to try CAM because conventional medical treatments weren't providing adequate pain relief. Nearly two-thirds said they experienced significantly reduced pain as a result of CAM therapy. Notably, only about one-fourth of the respondents reported getting a physician's referral to a CAM practitioner.

Chiropractic and Headaches A new study shows that a specific type of chiropractic technique—called spinal manipulative therapy (SMT)—can be particularly helpful for people who suffer from chronic headaches, especially headaches related to neck problems. The study compared the effects of SMT to those of light massage among two groups of patients who suffered frequent, severe headaches. The group who underwent spinal manipulative therapy from an experienced chiropractor reported less pain and fewer headaches than the group who had light massages. Significantly, the SMT group reported half as many headaches as the massage group during a 24-week period of follow-up.

Despite such growing evidence, physicians still advise consumers to use caution when considering any CAM therapy, especially one that has not been studied extensively.

Alternative Medical Systems

Many cultures formed complete systems of medical philosophy, theory, and practice long before the current Western biomedical approach was developed. The complete systems that are best known in the United States include traditional Chinese medicine (TCM), also known as traditional Oriental medicine, and homeopathy. Traditional medical systems have also been developed in many other regions of the world, including North, Central, and South America; the Middle East; India; Tibet; and Australia. In many countries, these medical approaches continue to be used today—frequently alongside Western medicine and quite often by physicians trained in Western medicine.

Alternative medical systems tend to have concepts in common. For example, the concept of life force or energy exists in many cultures. In traditional Chinese medicine, the life force contained in all living things is called *qi* (sometimes spelled *chi*). *Qi* resembles the *vis vitalis* (Latin for “life force”) of Greek, Roman, and European medical systems, and *prana* of ayurveda, the traditional medical system of India. Most traditional medical systems think of disease as a disturbance or imbalance not just of physical processes but also of forces or energies within the body, the mind, and the spirit. In traditional Chinese medicine, for example, the principle of balance is expressed as *yin* and *yang*, which are opposites that complement each other. Disease is often defined as a disturbance of *qi* reflecting an imbalance between *yin* and *yang*. Treatment aims at reestablishing equilibrium, balance, and harmony.

Because the whole patient, rather than an isolated body part or disease, is treated in most comprehensive alternative medical systems, it is rare that only a single treatment approach is used. Most commonly, multiple remedies and techniques are employed and are continually adjusted according to the changes in the patient’s health status that occur naturally or are brought about by the treatment.

Traditional Chinese Medicine Traditional Chinese medicine (TCM) is based on highly abstract concepts; a sophisticated set of techniques and methods; and individualized diagnosis, treatment, and prevention. Typically, no two diseases are alike in the TCM perspective. Two patients with the same diagnosis in Western medicine may get different diagnoses in TCM and will be given different treatments.

In TCM the free and harmonious flow of *qi* defines health of the body, mind, and spirit. Illness occurs when *qi* is deficient or the flow of *qi* is blocked or disturbed. TCM is believed to restore and balance the flow of blocked *qi*; the goal is not only to treat illnesses but also to increase energy, prevent disease, and support immunity.

Two of the primary treatment methods in TCM are **herbal remedies** and **acupuncture**. Chinese herbal remedies number about 5800. In addition to herbs, plant products, fungi (mushrooms), animal parts, and minerals may be used. These remedies, like everything else, have *yin* and *yang* properties or *qi*. When a disease is perceived to be due to a *yin*



Like acupuncture, shiatsu massage aims to stimulate and balance the flow of energy, or *qi*. Massage therapy is a popular treatment in many CAM modalities.

deficiency, remedies with more *yin* characteristics might be used for treatment. The use of a single medicinal substance is rare in Chinese herbal medicine; rather, several different substances are combined in precise proportions, often to make a tea or soup. For example, a remedy might include a primary herb that targets the main symptom, a second herb that enhances the effects of the primary herb, a third that lessens side effects, and a fourth that helps deliver ingredients to a particular body site.

Acupuncture is used to correct disturbances in the flow of *qi* through the insertion of thin needles at appropriate points through the skin. *Qi* is believed to flow through the body along several meridians, or pathways, and there are hundreds of acupuncture points located along these meridians. Acupuncturists use a variety of diagnostic techniques to identify the nature of the imbalance in a patient and to choose the points where acupuncture needles need to be applied. The traditional method consists of inserting approximately 4–16 needles and leaving them in place for 15 minutes or longer. Other means of stimulating acupuncture points include heat, pressure, friction, suction, or electrical stimulation. The points chosen for acupuncture are highly individualized for each patient, and they change during treatment as the patient’s health status changes.

traditional Chinese medicine (TCM) The traditional medical system of China, which views illness as the result of a problem in the quality, quantity, or flow of *qi*, the life force; therapies include acupuncture, herbal medicine, and massage.

herbal remedy A medicine prepared from plants.

acupuncture Insertion of thin needles through the skin at points along meridians—pathways through which *qi* is believed to flow.

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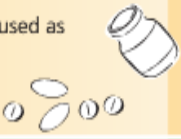
Domain	Characteristics	Examples
Alternative medical systems 	Systems of health/healing theory and practice that have evolved independently and long before conventional biomedical approaches.	Traditional Chinese medicine, ayurvedic medicine, homeopathy, naturopathy.
Mind–body medicine	Practices that use thoughts, beliefs, and other mental activities to affect the health and functioning of the physical body (including the brain).	Meditation, hypnosis, prayer, guided imagery, art therapy, music therapy, emotive writing. 
Natural biologic products	Plant (herbals) and animal products used as medicinals and dietary supplements. 	Ginko biloba, shark cartilage, probiotics (live bacteria that may have beneficial health effects when ingested).
Manipulative and body-based practices	Methods for adjusting, moving or touching the body to promote health and healing.	 Chiropractic, osteopathic manual therapy, massage.
Other CAM practices 	Therapeutic methods involving energy modalities.	Magnet therapy, light therapy, Reiki, qigong, therapeutic touch.

FIGURE 20.4 The categories of CAM.

The World Health Organization has compiled a list of more than 40 conditions for which acupuncture may be beneficial. At a conference called by the National Institutes of Health, a panel of experts analyzed the available information on the scientific evidence for the efficacy of acupuncture for the treatment of many of these conditions. These experts cited evidence that acupuncture was effective in relieving nausea and vomiting after chemotherapy, and pain after surgery, including dental surgery. Newer studies show that acupuncture may help relieve the painful symptoms of fibromyalgia and reduce the joint pain and stiffness of osteoarthritis. There is not yet enough evidence to show conclusively that acupuncture is effective for menstrual cramps, tennis elbow, carpal tunnel syndrome, asthma, or certain other conditions. Western researchers typically use a different framework for understanding the effects of acupuncture. For example, they might explain pain relief not in terms of qi but in terms of altering nervous system pathways, the relaxation of fascia (connective tissue surrounding muscles and tendons), and the release of hormones and neurotransmitters.

Almost no negative side effects have been reported with acupuncture. Although very rare, problems can occur from the improper insertion of needles by untrained practitioners and from the use of unsterile needles. The FDA regulates acupuncture needles like other standard medical devices and requires that they be sterile. If you consider acupuncture, you should ask your practitioner about the safety practices he or she observes. Most states require licensing for acupuncture practitioners, but requirements vary widely.

Homeopathy An alternative medical system of Western origin, **homeopathy** is based on principles including “like cures like,” and remedies become more effective with greater dilution. “Like cures like” summarizes the concept that a substance that produces the symptoms of an illness in a healthy person can help cure the illness when given in very minute quantities. Remedies containing very small quantities of a particular substance are produced by repeatedly diluting the original solution. The extent of dilution varies, but the final extract can be so dilute that few, if any, of the original molecules remain. According to homeopathic thinking, such highly diluted extracts not only retain some form of biological activity but actually become more potent.

More than 1000 different substances (plant and animal parts or products, minerals, and chemicals) are used to prepare homeopathic remedies, and each of these substances is thought to have different effects at different dilutions. That means a homeopathic practitioner must not only choose the correct remedy for a particular patient but also decide on the specific dilution of that remedy in order to achieve the desired effect.

Like other traditional systems of medicine, homeopathy constitutes a highly individualized form of therapy; that is,

homeopathy An alternative medical system that uses a holistic approach to diagnosis, and treatments that involve administering very small doses of remedies that would produce symptoms like those of the illness in larger doses.

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the treatment of each patient is determined by the overall condition of the patient rather than by specific signs and symptoms. To assess a patient's condition, homeopaths generally spend considerable time talking with a patient and assessing his or her physical, psychological, and emotional health before deciding on the correct remedy at the proper dilution. A typical evaluation may take approximately 90 minutes. This long and intensive interaction between the practitioner and the patient might play an important role in the success of the therapy. Indeed, critics of homeopathy often attribute its reported effectiveness to this nonspecific placebo effect (see the section of this chapter on "Pharmaceuticals and the Placebo Effect"). However, when the results of 185 homeopathic trials were analyzed in a recent study, it was concluded that the clinical effects of homeopathy could not be completely explained by the placebo effect. Homeopathy remains one of the most controversial forms of CAM.

Because of the extremely dilute nature of homeopathic remedies, it is generally assumed that they are safe. To date, the FDA has not reported any serious adverse effects associated with the use of homeopathy, with the possible exception of situations in which a patient might have been successfully treated with standard medical approaches but chose to rely solely on homeopathy. The FDA regulates some homeopathic remedies, but they are subject to many fewer restrictions than prescription or over-the-counter drugs. Some homeopathic remedies that are used to treat conditions such as colds and headaches can be sold over the counter. A few states require practitioners to have special licenses, but most providers practice homeopathy as a specialty under another license, such as a license to practice medicine or nursing.

Naturopathy The health care discipline of **naturopathy** is based in the premise that the body has the ability to restore and maintain optimal health. Naturopathic physicians help their patients by using holistic approaches for prevention, diagnosis, and treatment and by helping them to minimize risks and barriers to good health. They work in hospitals, clinics, and community health centers where they are licensed to practice in 15 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and five Canadian provinces. Licensure is granted after completing a four-year professional program in naturopathic medicine from an accredited naturopathic medical school and passing the Naturopathic Physicians Licensing Exam (NPLEX). Content includes basic medical sciences, clinical nutrition, acupuncture, homeopathic medicine, herbology, psychology, and counseling. The scope of practice varies according to state and provincial regulations. The most frequently treated conditions include allergies, chronic pain, obesity, heart disease, fertility problems, and cancer. Naturopaths can perform minor surgery such as cyst removal and skin suturing. They are also trained to use

prescription medications, although their education emphasizes natural modalities for healing.

Mind–Body Medicine

Mind–body interventions make use of the integral connection between mind and body and the effect each can have on the other. They include many of the stress management techniques discussed in Chapter 2, including meditation, yoga, visualization, taijiquan, and biofeedback. Psychotherapy, support groups, prayer, and music and art therapy can also be thought of as mind–body interventions. The placebo effect is one of the most widely known examples of mind–body interdependence.

Hypnotherapy is considered to be a CAM modality, although its use for certain conditions was accepted more than 40 years ago by the American Medical Association. Hypnotherapy involves the induction of a state of deep relaxation during which the patient is more likely to accept suggestions to influence health and overcome conditions such as chronic pain, pain during surgery or childbirth, unhealthy habits, and anxiety and phobias. Hypnotherapy is usually facilitated by a professional with take-home instructions for the patient to continue the sessions through self-hypnosis. The practitioner helps the patient change unwanted behavior or deal with pain and other symptoms. An NIH-sponsored report found strong evidence for the effectiveness of relaxation techniques and hypnosis in reducing chronic pain stemming from a variety of medical conditions.

Health professionals who are properly trained in hypnotherapy use this modality to augment their conventional treatments. Training and certification are offered by several hypnotherapy associations or agencies. Many states require hypnotherapists to be licensed, but the requirements for licensing vary substantially. There is little regulation of practitioners of other relaxation techniques, but it is very rare that adverse events result from such techniques. Many studies have shown that the mind–body interventions such as self-hypnosis for relaxation, support groups, friendships, strong family relationships, meditation, and prayer can all have a positive impact on health.

QUICK STATS

18 million
American adults
undergo massage
therapy each year.

—NCCAM, 2009

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naturopathy An alternative medical system based on supporting the body's ability to heal itself and maintain optimal health by removing barriers and creating a healing internal and external environment.

hypnotherapy The process by which a practitioner induces a state of relaxation in which the patient is more likely to achieve an agreed-upon health outcome; commonly used for managing pain, phobias, and addictions.

Natural Products

Natural products, also known as *biologically based therapies*, include substances derived from plant or animal sources. They consist primarily of herbal therapies or remedies, botanicals, and extracts from animal tissues (such as shark cartilage). Herbal remedies are a major component of all indigenous forms of medicine. Prior to the development of pharmaceuticals at the end of the 19th century, people everywhere in the world relied on materials from nature for pain relief, wound healing, and treatment of a variety of ailments. Much of the **pharmacopoeia** of present-day scientific medicine originated in the folk medicine of native people, and many drugs used today are derived from plants.

Most natural products are sold as dietary supplements and are therefore largely unregulated by the FDA. Like foods, dietary supplements must carry ingredient labels (see Chapter 12), and manufacturers are responsible for ensuring that their dietary supplements are safe and properly labeled for marketing. The FDA is responsible for monitoring the labeling and accompanying literature of dietary supplements and for overseeing their safety once they are on the market.

Well-designed clinical studies have been conducted on a number of natural products. A few commonly used herbals, their uses, and the evidence supporting their efficacy are presented in Table 20.2. Participants in clinical trials with herbals such as St. John's wort, ginkgo biloba, and echinacea experienced only minor adverse events. New studies are also evaluating the effects of varying dosages and their interactions with conventional drugs.

Although most drug–herb interactions are relatively minor compared to conventional drug–drug interactions, some can be potentially serious. For example, herbs that have anti-coagulant (anticlotting) properties, such as ginkgo biloba, when used concurrently with the commonly prescribed anti-coagulant Coumadin, can result in delayed blood clotting or hemorrhage. St. John's wort interacts with drugs used to treat HIV infection and heart disease, and the herb may also reduce the effectiveness of oral contraceptives, antirejection drugs used in patients receiving organ transplants, and some medications used to treat infections, depression, asthma, and seizure disorders. Supplements containing kava kava have been linked to liver damage, and anyone who has liver problems, drinks large amounts of alcohol, or takes medications that can affect the liver is advised to consult a physician or pharmacist before using kava kava–containing supplements.

Another potential problem is the possibility of contaminants. In a sample of ayurvedic herbal medicine products,

20% were found to contain potentially harmful levels of lead, mercury, or arsenic. The Dietary Supplement Health and Education Act of 1994 requires that dietary supplement labels list the name and quantity of each ingredient. The content of herbal preparations is also variable. Botanicals are naturally grown products. Herb producers do not have complete control over natural products any more than farmers have control over the vitamin content of fruit.

Reputable herbal manufacturers have adopted self-regulated safety practices and quality control standards that help assure purity and potency. As an attempt toward standardization, many herb producers identify the analysis results of selected active ingredients. Lot numbers should appear on the container along with a website that can be consulted. Some responsible retailers check the safety and purity standards of the herbal preparations they sell. Informed consumers should always examine containers for analysis results, lot numbers, and a website, and purchase products only from reputable sources and avoid those that are questionable or discounted. Reputable retailers sell only products with this identifying information, and some send qualified inspectors to the site of production to verify the label information.

These self-imposed quality control measures and the Dietary Supplement Health and Education Act of 1994 have increased consumer confidence and helped avert additional government-imposed regulation. Today this level of disclosure and standardization is rarely seen in the production of foods by the agricultural industry.

In the United States, because herbs are considered supplements rather than drugs, they are currently not required to meet FDA food and drug standards for safety or effectiveness, nor are they required to meet any manufacturing standards. The manufacturer is responsible for ensuring that a supplement is safe before it is marketed; the FDA has the power to restrict a substance if it is found to pose a health risk after it is on the market.

Studies have shown that most people do not reveal their use of CAM therapies to their conventional health care providers, a problem that can have significant health consequences. Any herbs that are used in combination with conventional drugs should be evaluated for safety by a knowledgeable health care provider such as a pharmacist.

Manipulative and Body-Based Practices

These modalities are based on manipulating or moving one or more body parts. Touch and body manipulation are longstanding forms of health care. Manual healing techniques are based on the concept that misalignment or dysfunction in one part of the body can cause pain or dysfunction in that or another part. Correcting these misalignments can help restore optimal health.

Chiropractic Many manipulative and body-based practices are integral components of physical therapy and osteopathic

natural products CAM therapies that include biologically based interventions and products; examples include herbal remedies, extracts from animal tissues, and dietary supplements.

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pharmacopoeia A collection of descriptions and formulas for drugs and medicinal preparations.

Table 20.2**Commonly Used Herbals, Their Uses, Evidence for Their Effectiveness, and Contraindications**

BOTANICAL	USE	EVIDENCE	EXAMPLES OF ADVERSE EFFECTS AND INTERACTIONS
Cranberry (<i>Vaccinium macrocarpon</i>)	Prevention or treatment of urinary tract disorders	May eliminate and prevent bacteria from infecting the urinary tract	None known
Dandelion (<i>Taraxacum officinale</i>)	As a “tonic” against liver or kidney ailments	None yet	May cause diarrhea in some users; people with gallbladder or bile duct problems should not take dandelion
Echinacea (<i>Echinacea purpurea</i> , <i>E. angustifolia</i> , <i>E. pallida</i>)	Stimulation of immune functions; to prevent colds and flulike diseases; to lessen symptoms of colds and flu	Some trials showed that it prevents colds and flu and helps patients recover faster from colds	Might cause liver damage if taken over long periods of time (more than 8 weeks); since it is an immune stimulant, it is not advisable to take it with immune suppressants (e.g., corticosteroids) or during chemotherapy
Evening primrose oil (<i>Oenothera biennis</i> L.)	Reduction of inflammation	Long-term supplementation effective in reducing symptoms of rheumatoid arthritis	None known
Feverfew (<i>Tanacetum parthenium</i>)	Prevention of headaches and migraines	Most trials indicate that it is more effective than placebo	Should not be used by people allergic to other members of the aster family; has the potential to increase the effects of warfarin and other anticoagulants
Garlic (<i>Allium sativum</i>)	Reduction of cholesterol	Short-term studies have found a modest effect	May interact with some medications, including anticoagulants, cyclosporine, and oral contraceptives
Ginkgo (<i>Ginkgo biloba</i>)	Improvement of circulation and memory	Improves cerebral insufficiency and slows progression of Alzheimer’s disease and other types of senile dementia in some patients; improves blood flow in legs	Could increase bleeding time; should not be taken with nonsteroidal anti-inflammatory drugs or anticoagulants; gastrointestinal disturbance
Ginseng (<i>Panax ginseng</i>)	Improvement of physical performance, memory, immune function, and glycemic control in diabetes; treatment of herpes simplex 2	No conclusive evidence exists for any of these uses	Interacts with warfarin and alcohol in mice and rats, so should probably not be used with these drugs; may cause liver damage
St. John’s wort (<i>Hypericum perforatum</i>)	Treatment of depression	There is strong evidence that it is significantly more effective than placebo, is as effective as some standard antidepressants for mild to moderate depression, and causes fewer adverse effects	Known to interact with a variety of pharmaceuticals and should not be taken together with digoxin, theophylline, cyclosporine, indinavir, and serotonin reuptake inhibitors
Saw palmetto (<i>Serenoa repens</i>)	Improvement of prostate health	Studies show that saw palmetto may reduce mild prostate enlargement	Has no known interactions with drugs, but should probably not be taken with hormonal therapies
Valerian (<i>Valeriana officinalis</i>)	Treatment of insomnia	Appears to help with sleep disorders	Interacts with thiopental and pentobarbital and should not be used with these drugs

medicine, although certain techniques fit the definition of CAM because they are not a part of conventional health care practice. Unconventional healing methods include massage, acupressure, and numerous other techniques. The most commonly used CAM manual healing method is **chiropractic**, a method that focuses on the relationship between structure and function, primarily of the spine, joints, muscles, and the nervous system, to maintain or restore health. An important therapeutic

procedure is the manipulation of joints, particularly those of the spinal column. However, chiropractors also use a variety

chiropractic A system of manual healing most frequently used to treat musculoskeletal problems; the primary treatment is manipulation of the spine and other joints.

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of other techniques, including exercise, patient education and lifestyle modification, nutritional supplements, and orthotics (mechanical supports and braces) to treat patients. They do not use conventional drugs or surgery.

Chiropractors, or doctors of chiropractic, are trained for a minimum of four years at accredited chiropractic colleges and can go on to postgraduate training in many countries. Although specifically listed by NCCAM as one of the manipulative and body-based practices of CAM, chiropractic is accepted by many health care and health insurance providers to a far greater extent than the other types of CAM therapies. Based on research showing the efficacy of chiropractic management in acute low-back pain, spinal manipulation has been included in the federal guidelines for the treatment of this condition, and electrodiagnostic tests show that chiropractic is effective in controlling back pain. Promising results have also been reported with the use of chiropractic techniques in neck pain and headaches.

A word of caution is in order: Spinal manipulation must be performed only by a properly trained professional such as a chiropractor, osteopathic physician, or physical therapist who is specially trained and certified in orthopedic manual physical therapy (OMPT). Your state's medical and osteopathic board or a local health service locator will help you find qualified practitioners near you.

Exercise Exercise for health maintenance, promotion, and disease prevention currently fits the definition of a CAM modality. However, this is changing due to an active campaign by the American College of Sports Medicine (ACSM) and the American Medical Association (AMA). A study has found that 65% of Americans would be more interested in exercising for staying healthy if advised to do so by their physicians.

A new program, Exercise Is Medicine™, encourages physicians to record a patient's exercise level as a routine vital sign during clinical visits, along with pulse, respiratory rate, temperature, and blood pressure. Those who are able will be advised to exercise for 30 minutes and to stretch and engage in light muscle training for an additional 10 minutes five days each week. The Exercise Is Medicine website (www.exercisismedicine.com) advises physicians, other health care providers, medical educators, and the public about the benefits of exercise. Through efforts such as this, exercise is likely to transition from a CAM modality to a conventional modality and be taught in American medical schools and recommended as a treatment in American health care institutions.

Other CAM Practices

CAM practices also include movement therapies, traditional healing practices, and energy therapies. Movement therapies are approaches that use movement to promote physical, mental, emotional, and spiritual well-being, such as the Feldenkrais method, the Alexander technique, and Pilates. Traditional healers use methods based on indigenous theories, beliefs, and experiences handed down from generation to generation. Examples are the Native American medicine man or woman and the shaman, the traditional healer in many cultures.



One of several energy medicine therapies, Reiki has bioenergetic and physical components.

Energy therapies are forms of treatment that use energy originating from the patient's or therapist's body or from other sources such as therapeutic magnets and TENS units used in physical therapy. Energy therapies are based on the concept that energy surrounds and penetrates the body and can be influenced by movement, touch, pressure, or the placement of hands in or through the fields. There is some evidence supporting energy theory because the body's electromagnetic energy can be measured through electrocardiography (ECG), electromyography (EMG), and electroencephalography (EEG).

Qigong, a component of traditional Chinese medicine, combines movement, meditation, and regulation of breathing

energy therapies Forms of CAM treatment that use energy fields originating either within the body or from outside sources to promote health and healing.

TERMS

qigong A component of traditional Chinese medicine that combines movement, meditation, and regulation of breathing to enhance the flow of qi, improve blood circulation, and enhance immune function.

to enhance the flow of qi to improve blood circulation and enhance immune function.

Therapeutic touch is derived from ancient techniques involving using the hands to detect and transmit energy (electromagnetic energy). It is based on the premise that healers can identify and correct energy imbalances by passing their hands over the patient's body.

Reiki is another example of energy therapy; it is intended to correct disturbances in the flow of life energy (*ki* in the Japanese tradition) and enhance the body's healing powers through the use of specific hand positions on or near the patient's body to promote balance.

Bioelectromagnetics is the study of interactions between living organisms and electromagnetic fields, both those produced by the organism itself and those produced by outside sources. The recognition that the body produces electromagnetic fields has led to the development of many diagnostic procedures in Western medicine, including electroencephalography (EEG), electrocardiography (ECG), and nuclear magnetic resonance imaging (MRI).

Bioelectromagnetic-based therapies include the use of electromagnetic fields to manage pain, increase blood flow, and treat conditions such as arthritic pain. The application of therapeutic magnets to the body is included under bioelectromagnetic therapies. There are some indications that the use of electromagnetic fields might be useful for bone repair, wound healing, nerve stimulation, immune system stimulation, and modulation of the neuroendocrine (nervous and hormonal) system. Although promising, the available research is still limited and does not allow firm conclusions about the efficacy of these therapies.

Evaluating Complementary and Alternative Therapies

Because there is less information available about complementary and alternative therapies, as well as less regulation of associated products and providers, it is important for consumers to take an active role when they are thinking about using them.

Working with Your Physician When a health issue might be serious, the NCCAM advises consumers not to

seek complementary therapies without first consulting a conventional health care provider. It's usually best to become informed and discuss conventional treatments that have been shown to be beneficial for your condition. If you are thinking of trying any complementary or alternative therapies, it is important to discuss this with your physician, pharmacist, or other conventional provider who is knowledgeable about your health status and is also informed about CAM or is willing to learn by consulting proper resources. If they are not informed about CAM, it may be helpful to bring information from reliable, evidence-based sources with you. Areas to discuss with your physician or pharmacist include the following:

- **Safety:** Whether or not the treatment is effective, it *must* be safe. Is there something unsafe about the treatment for you specifically? Are there safety issues you should be aware of, such as drug–herb interactions?
- **Effectiveness:** Is there evidence-based research about the use of the therapy for your condition? If definitive evidence about effectiveness is lacking but the treatment is safe and causes no interaction with your conventional treatment, you should make an informed decision in consultation with your physician.
- **Timing:** Is the immediate use of a conventional treatment indicated?
- **Cost:** Is the therapy likely to be expensive, especially in light of the potential benefit?

If appropriate, schedule a follow-up visit with your physician to assess your condition and your progress after a certain amount of time using a complementary therapy. Keep a symptom diary to track your symptoms and gauge your progress. (Symptoms such as pain and fatigue are difficult to recall with accuracy, so an ongoing symptom diary is an important tool.) If your physician advises against CAM and the advice is supported by good evidence, you should probably not use it. If your physician is simply unreceptive or uninformed about CAM, you may need to find another physician whose health beliefs are compatible with your own. If you plan to pursue a therapy against your physician's advice, you need to tell him or her.

For supplements, particularly botanicals, pharmacists can also be an excellent source of information; they should be informed about any other unconventional or conventional medications you are taking.

Questioning the CAM Practitioner You can also get information from individual practitioners and from schools, professional organizations, and state licensing boards. Ask about education, training, licensing, and certification. If appropriate, check with local or state regulatory agencies or the consumer affairs department to determine if any complaints have been lodged against the practitioner.

NCCAM advises consumers not to seek CAM treatment without talking to their usual health care providers first.

therapeutic touch A CAM practice based on the premise that healers can identify and correct energy imbalances by passing their hands over the patient's body.

TERMS

Reiki A CAM practice intended to correct disturbances in the flow of life energy and enhance the body's healing powers through the use of various hand positions on the patient.

bioelectromagnetic-based therapies CAM therapies based on the notion that electromagnetic fields can be used to promote healing and manage pain.

ASSESS YOURSELF

Talking to Your Physician about Using CAM



Before talking to your physician about using a CAM modality, see how prepared you are by answering these questions:

- T F 1. You are the exception—your physician's patients rarely use CAM.
- T F 2. Most physicians are familiar with CAM through their extensive medical training.
- T F 3. Before trying any CAM modality for an illness, it's better to try a conventional remedy first.
- T F 4. CAM modalities are based on folk remedies, so there is no scientific information available.
- T F 5. CAM modalities are safe and natural, so they can only help or do nothing at all.
- T F 6. Because herbal preparations are derived from plants and are not regulated by the FDA, there are no purity assurances.
- T F 7. Acupuncture has few risks.
- T F 8. If you have a CAM modality in mind, you should bring with you a scientifically based article about it for your physician to read.
- T F 9. If you experience any improvement after using CAM, it is probably a placebo effect.
- T F 10. Routine medical assessments such as physical exams and lab tests cannot be used to show how your body is responding to CAM interventions.
- T F 11. After discussing your ideas about using CAM with your physician, you should choose between using either CAM or a conventional modality.
- T F 12. CAM is not covered by most health insurance policies.

Answers

1. False. Scientific studies show that more than one-third of Americans use CAM.
2. False. Most physicians have only been introduced to CAM—many through a single one-hour lecture. CAM is not yet a significant part of most medical curricula.
3. False. It is generally advantageous to choose the treatment(s) most likely to work, the fewest side effects, and the highest benefit-to-risk ratio. The treatment(s) of choice may be conventional or unconventional.
4. False. Numerous studies on CAM have been conducted and more are under way, sponsored mostly by the NCCAM.
5. False. Not all CAM modalities are completely safe, and many have synergistic or opposing effects when used together with conventional treatments.
6. False. Even though these products are plant derived and not regulated in the United States as they are in some other countries, industry self-regulation can be effective.
7. True. When administered by trained professional acupuncturists, any risk is exceedingly rare.
8. True. Evidence-based studies published in peer-reviewed scientific journals are likely to be helpful for many physicians. Articles and CAM guidelines are also published online by governmental agencies, universities, and reputable hospitals and clinics.
9. False. Through randomized controlled trials, many CAM modalities have been shown to be efficacious compared to placebo or sham modalities. All treatments, conventional and unconventional, have a placebo effect component.
10. False. Many of the assessments that are used to evaluate conventional interventions are also used to evaluate CAM.
11. False. The best modalities should be chosen from among the conventional and the unconventional ones available; choices should be based on safety, efficacy, risk-to-benefit ratio, and cost.
12. True. Most CAM is not covered. However, some modalities that are part of physical therapy, such as chiropractic and massage, may be covered.

If you answered 10 or more questions correctly, you are probably ready to have an informed discussion about CAM use with your physician or to find a physician who is at least receptive to your inquiry.

Some guidelines for talking with a CAM practitioner include the following:

- Ask the practitioner why he or she thinks the therapy will be beneficial for your condition. Ask for a full description of the therapy and any potential side effects. In all cases, demand an evidence-based approach.
- Describe in detail any conventional treatments you are receiving or plan to receive.
- Ask how long the therapy should continue before it can be determined if it is beneficial.
- Ask about the expected cost of the treatment. Does it seem reasonable? Will your health insurance pay some or all of the costs?

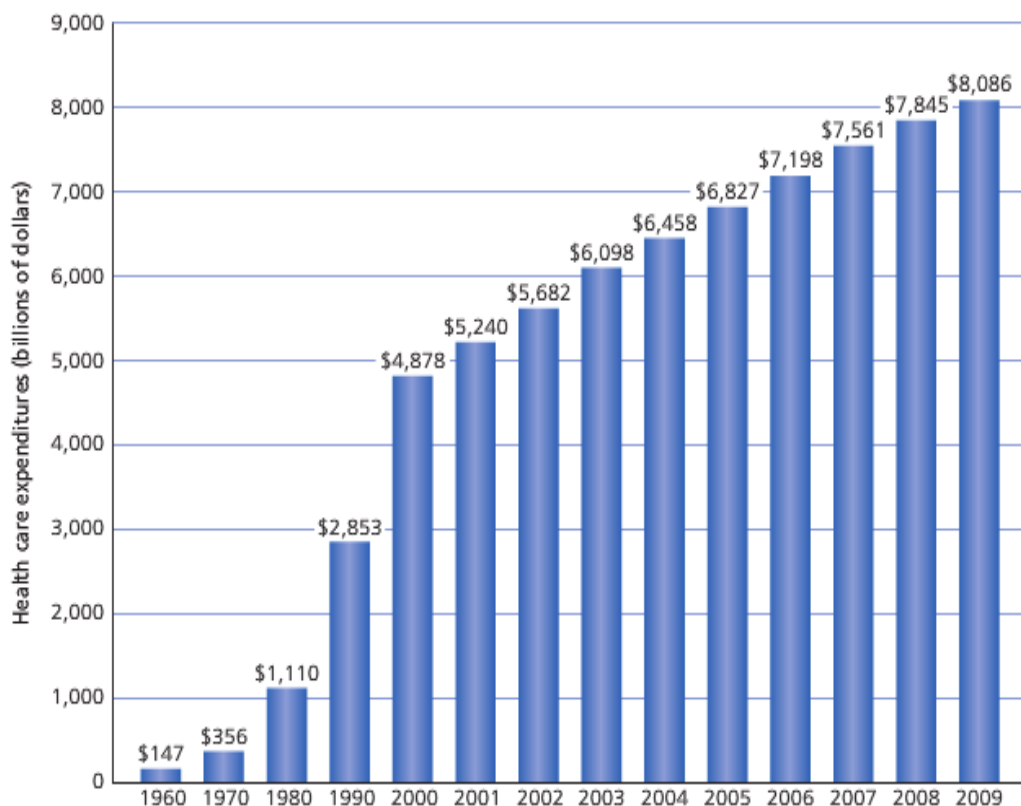


FIGURE 20.5 National health care expenditures (public and private), 1960–2009.

SOURCE: National Center for Health Statistics. 2010. *Health, United States: 2009*. Hyattsville, MD: National Center for Health Statistics.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever considered using a complementary or alternative treatment? If so, was it in addition to conventional treatment or instead of it? What kind of research did you do before having the treatment? What advice did your primary health care provider give you about it?

If anything an unconventional practitioner says or recommends directly conflicts with advice from your physician, discuss it with your physician before making any major changes in your current treatment regimen or lifestyle.

PAYING FOR HEALTH CARE

The American health care system is one of the most advanced and comprehensive in the world, but it is also the most expensive (Figure 20.5). In 2009 Americans spent \$2.4 trillion on health care, or more than \$8000 per person. Many factors contribute to the high cost of health care in the United States, including the cost of advanced equipment and new technology, expensive treatments for some illnesses, aging of the population, and the demand for profits by many commercial health care providers.

The Current System

Health care is financed by a combination of private and public insurance plans, patient out-of-pocket payments, and government assistance. Currently, private insurance and individual patients pay about 55% of the total; the government pays the rest, mainly through Medicare and Medicaid (Figure 20.6). Most nonelderly Americans receive health insurance through their employers, but the number of Americans with private insurance declined by 10% between 1984 and 2007.

By some estimates, as many as 50 million Americans—the vast majority of them employed—have no health insurance at

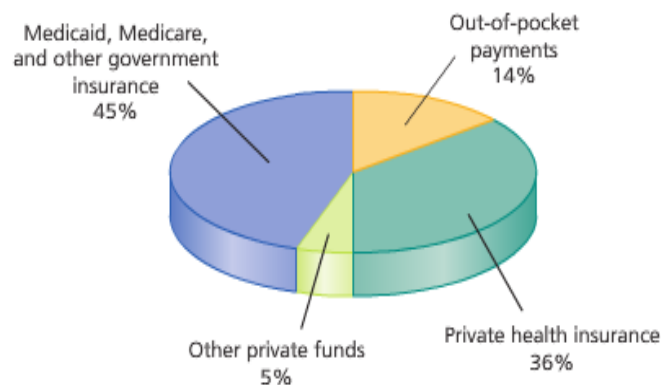


FIGURE 20.6 Paying for Americans' health care services, 2009.

SOURCE: National Center for Health Statistics. 2010. *Health, United States: 2009*. Hyattsville, MD: National Center for Health Statistics.

all. Many more are underinsured, meaning they may be uninsured for periods of time, have health insurance that does not cover all needed services, and/or have high-out-of-pocket costs. New and extended government health insurance programs for children have reduced the number of Americans under age 18 who lack health insurance; still, 9.8 million American children were uninsured in 2010.

Uninsured and underinsured people use health services less often and receive lower-quality care when they do use health services. Children without insurance are less likely to have screening tests and immunizations. They have fewer checkups, are less likely to be treated for injuries and for chronic conditions such as asthma, and are more likely to go without eyeglasses and prescribed drugs.

Health Insurance

Health insurance protects you against losses incurred for medical expenses. These may be due to illness or bodily injury or for other services such as preventive yearly physical exams. Depending on the policy, coverage may also include medications; physician services; hospital stays; emergency department visits; physical, occupational, and speech therapy; vision care; dental coverage; and other expenses. Riders for specific CAM coverage is offered by some insurance companies for an additional charge. Policies differ based on the services covered, the amount of the deductible and the copayment, and the limit of coverage. Of course, with many plans, the more services one adds to the policy, the higher the premiums. Coverage may be provided as an employment benefit or through a government-sponsored plan such as Medicaid (for certain disabled and low-income individuals) or Medicare (typically individuals aged 65 or older and those with certain illnesses).

Health insurance enables people to receive health care they might not otherwise be able to afford. Hospital care costs hundreds of dollars a day, and surgical fees can cost thousands. A serious illness or accident can cost over a million dollars. Health insurance is important for everyone, especially as health care costs continue to rise.

Health insurance plans are either fee-for-service (indemnity) or managed care. With both types, the individual or the employer pays a basic premium, usually on a monthly basis; there are often other payments as well. Insurance policies are sold to both groups and individuals; group plans tend to cover more services and cost less. Group coverage is often available through employers to workers and their families; however, millions of workers are opting out of these company-sponsored plans because of high premiums. About 3 million fewer workers signed up for such plans in 2003 than in 1998. People who are self-employed or whose employers don't offer group policies may need to buy individual plans.

Traditional Fee-for-Service (Indemnity) Plans In a fee-for-service, or indemnity, plan, you can use any physician or hospital you choose. You or the provider sends the bill to your insurance company, which pays part of it. Usually you have to pay a deductible amount each year, and then the plan

will pay a percentage—often 80%—of what it considers the “usual and customary” charge for covered services. You pay the remaining 20%, which is known as coinsurance.

Freedom of choice is a major benefit of indemnity plans. You can see any physician you choose, including specialists. Your physician is paid based on the services he or she provides. Critics point to the fee-for-service payment system as a contributing factor in the rapid growth of U.S. health care costs because physicians have a financial incentive to order more tests and treatments for their patients. However, the vast majority of working Americans are now covered by managed care plans.

Managed Care Plans Managed care plans have agreements with a network of specified physicians, hospitals, and health care providers to offer a range of services to plan members at reduced cost. In general, you have lower out-of-pocket costs and less paperwork with a managed care plan than with an indemnity plan, but you also have less freedom in choosing your health care providers. Most Americans with job-based insurance are covered by managed care plans, which may follow several different models:

- **Health maintenance organizations (HMOs)** offer members a range of services for a set monthly fee. You choose a primary care physician who manages your care and refers you to specialists if you need them. If you go outside the HMO, you have to pay for the service yourself. Physicians in the HMO agree to accept a monthly per-patient fee, or **capitation**, or to charge less than standard fees for services.
- **Preferred provider organizations (PPOs)** have arrangements with physicians and other providers who have agreed to accept lower fees. If you go outside the PPO, you have to pay more.
- **Point-of-service (POS) plans** are options offered by many HMOs in which you can see a physician outside the plan and still be partially covered (for example, for a specialist outside the network).

managed care plan A health care program that integrates the financing and delivery of services by using designated providers, utilization review, and incentives for following the plan's policies; HMOs, PPOs, and POS plans are managed care plans.

health maintenance organization (HMO) A prepaid health insurance plan that offers health care from designated providers.

capitation A payment to health care providers according to the number of patients they agree to serve, rather than the amount of services rendered.

preferred provider organization (PPO) A prepaid health insurance plan in which providers agree to deliver services for discounted fees; patients can go to any provider, but using nonparticipating providers results in higher costs to the patient.

point-of-service (POS) plan A managed care plan that covers treatment by an HMO physician but permits patients to seek treatment elsewhere with a higher copayment.

TERMS

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What type of health insurance coverage do you have? If you have coverage, do you know what types of medical services are fully or partially covered? What are your copayments and deductibles? If you were faced with a medical emergency, would you know how to contact and work with your insurer to make sure your costs were covered?

Many managed care plans try to reduce costs over the long term by paying for routine preventive care, such as regular checkups and screening tests and prenatal care; they may also encourage prevention by offering health education and lifestyle modification programs for members.

Other cost-cutting measures are less consumer-oriented. Consumers' choice of physicians is limited, and they may have to wait longer for appointments and travel farther to see participating doctors or receive specialized tests. Managed care plans may also try to discourage overtreatment through the use of gatekeepers: in many plans, patients must get pre-approval from their primary care physician (PCP) or a plan representative for diagnostic tests, referrals to specialists, or hospital treatments. If a patient violates the rules for obtaining services, the plan typically will not cover the cost of the services in question. Nonemergency visits to emergency departments are also frequently not covered.

Government Programs Americans who are 65 or older and younger people with certain disabilities can be covered by **Medicare**, a federal health insurance program that helps pay for hospitalization, physician services, and prescription drugs. As a result of limits placed on payments, however, some physicians and managed care programs have stopped accepting Medicare patients. **Medicaid** is a joint federal-state health insurance program that covers some low-income people, especially children, pregnant women, and people with certain disabilities. The number of people and the number and cost of services covered by government programs has grown in recent years, challenging the ability of these programs to make all payments.

Medicare A federal health insurance program for people 65 or older and for younger people with certain disabilities.

Medicaid A federally subsidized state-run plan of health care for people with low income.

TERMS

Health Care Reform

In March 2010 Congress passed the Affordable Care Act, a sweeping reform of the health care industry that could ultimately extend health insurance coverage to some 32 million Americans who are currently uninsured. The law aims to make medical coverage more affordable and widely available through two broad types of action:

- Subsidizing insurance coverage for Americans who cannot afford it. Millions of Americans live without health care insurance simply because they cannot pay the premiums. This is particularly true for low-income Americans, large families, the unemployed, and people with serious health conditions. The law also opens Medicaid to more Americans by loosening income requirements and other restrictions. The act provides federal and state funding to subsidize insurance coverage for qualified Americans who cannot access health care coverage through employer-sponsored or private plans. However, not everyone will qualify for free or low-cost



Some workers will still be uninsured under the new health care legislation.

coverage under the federal law, such as illegal immigrants, people with no permanent address who do not meet residency requirements, and rural residents who cannot access services in their area even though they are eligible.

- Placing tighter restrictions on the insurance industry. As described in Chapter 1, the Affordable Care Act restricts or bans certain insurance industry practices that have prevented millions of Americans from getting health care insurance. Some restrictions (such as banning lifetime coverage limits and prohibiting discrimination against children with preexisting health conditions) began in 2010; other regulations will gradually take effect through 2014.

The act also creates health care insurance “exchanges,” where qualified Americans can purchase affordable coverage. Each state will ultimately have its own exchange. Exchanges will offer a variety of coverage options from private insurance companies, with the goal of creating competitive rates to make plans more affordable. In 2010 the federal government began working with individual states to create exchanges, and every state should have its own exchange in place by no later than 2014.

For more information about the Affordable Care Act, visit the U.S. government’s health care website at www.healthcare.gov.

TIPS FOR TODAY AND THE FUTURE

Most of the time you can take care of yourself without consulting a health care provider. When you need professional care, you can still take responsibility for yourself by making informed decisions.

RIGHT NOW YOU CAN:

- Make sure you have enough of your prescription medications on hand, and your prescriptions are up-to-date.
- If you take any supplements (dietary or herbal), ask your pharmacist if they can interact with any prescription drugs you are taking.
- Stock your home and car with basic first aid supplies.

IN THE FUTURE YOU CAN:

- Thoroughly research complementary or alternative medical treatments you are using or considering to make sure they are considered safe and effective.
- Review your medical insurance policy and make sure you are familiar with your coverage and the policy’s terms. If you have any questions about your policy, contact your insurance agent. If you don’t have medical insurance, start investigating your options.

Connect to Your Choices

Have you ever thought about where you get your attitudes toward conventional medicine and complementary and alternative medicine? Many factors can influence our attitudes, some not as obvious as others. When you were growing up, was your family respectful of the medical establishment, or were they skeptical of it? Did your parents or grandparents use herbal remedies? Do any of your peers express strong opinions about physicians or CAM practices? Are there CAM practitioners in your community? Do you know people who see chiropractors or get acupuncture or massages?

What are the external factors that influence your choices about medicine? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

SUMMARY

- Informed self-care requires knowing how to evaluate symptoms. It’s necessary to see a physician if symptoms are severe, unusual, persistent, or recurrent.
- Self-treatment doesn’t necessarily require medication, but OTC drugs can be a helpful part of self-care.
- Conventional medicine is characterized by a focus on the physical causes of disease; the identification of a set of signs and symptoms for different diseases; the development of public health measures to prevent disease and drugs and surgery to treat them; the use of scientific thinking to understand phenomena; and a well-established research methodology.
- Conventional practitioners include medical doctors, doctors of osteopathic medicine, podiatrists, optometrists, and dentists, as well as allied health care providers and nurses.
- The diagnostic process involves a medical history, a physical exam, and medical tests. Patients should ask questions about medical tests and treatments recommended by their physicians.
- Safe use of prescription drugs requires knowledge of what the medication is supposed to do, how and when to take it, and the possible side effects.
- All surgical procedures carry risk; patients should ask about alternatives and get a second opinion from another physician.
- Complementary and alternative medicine (CAM) is defined as those therapies and practices that do not form part of conventional health care and medical practice as taught in most U.S. medical schools and offered in most U.S. hospitals.

- CAM is characterized by a view of health as a balance and integration of body, mind, and spirit; a focus on ways to restore the individual to optimal functioning using methods from the five fields of CAM practice as defined by the National Institutes of Health; and a body of knowledge based on the accumulated observations and experience of practitioners, often over decades or centuries, and more recently, on the scientific evaluation of modalities for safety and efficacy.
- Alternative medical systems such as traditional Chinese medicine and homeopathy are complete systems of medical philosophy, theory, and practice.
- Mind–body medicine includes meditation, biofeedback, group support, hypnosis, and prayer.
- Natural products include herbal remedies, botanicals, animal tissue products, and dietary supplements.
- Manipulative and body-based practices include massage and other healing techniques; the most frequently used is chiropractic.
- Other CAM practices include movement therapies, traditional healing practices, and energy therapies.
- Because there is presently less information available about CAM and less regulation of its providers and modalities, consumers must be proactive in researching and choosing treatments, using critical thinking skills, examining the available evidence-based information available, and exercising caution.
- Health insurance plans are usually described as either fee-for-service (indemnity) or managed care plans. Indemnity plans allow consumers more choice in medical providers, but managed care plans are less expensive.
- Government programs include Medicaid for the poor, and Medicare for those aged 65 and over or chronically disabled.
- Recent government reforms of the health care industry (particularly the insurance industry) aim to make affordable health care insurance coverage available to more Americans than ever before.

FOR MORE INFORMATION

BOOKS

- American College of Physicians. 2009. *The ACP Evidence-Based Guide to Complementary and Alternative Medicine*. Washington, DC: American College of Physicians. *Highly regarded manual of CAM practices and evidence supporting them.*
- Mayo Clinic. 2010. *The Mayo Clinic Book of Alternative Medicine*, 2nd edition. New York: Time-Life. *A concise review of currently popular CAM therapies and treatments.*
- Micozzi, M. S. 2010. *Fundamentals of Complementary and Alternative Medicine*, 4th ed. New York: Saunders. *Detailed descriptions of the CAM modalities, with evidence supporting specific therapies for certain conditions.*
- PDR. 2011. *PDR for Nonprescription Drugs, Dietary Supplements, and Herbs*, 2011, 32nd ed. Montvale, NJ: Thomson Healthcare. *A reference covering the safety and efficacy of over-the-counter medications and herbals.*

ORGANIZATIONS, HOTLINES, AND WEBSITES

Agency for Healthcare Research and Quality (AHRQ). Provides practical, evidence-based information about health care treatments and outcomes for consumers and practitioners.

<http://www.ahrq.gov>

American Board of Medical Specialties. Provides information about board certification, including information about specific physicians.

<http://www.abms.org>

American Chiropractic Association. Provides information about chiropractic care, consumer tips, and a searchable directory of certified chiropractors.

<http://www.acatoday.org>

American Medical Association (AMA). Provides information about physicians, including their training, licensure, and board certification.

<http://www.ama-assn.org>

American Osteopathic Association. Provides information about osteopathic physicians, including board certification.

<http://www.osteopathic.org/Pages/default.aspx>

ConsumerLab.com. Provides information about the results of tests of dietary supplements, including information about actual ingredients and concentrations.

<http://www.consumerlab.com>

Food and Drug Administration: Information for Consumers. Provides materials about dietary supplements, foods, prescription and OTC drugs, and other FDA-regulated products.

<http://www.fda.gov/ForConsumers/default.htm>

National Center for Complementary and Alternative Medicine (NCCAM). Provides general information packets, answers to frequently asked questions about CAM, consumer advice for safer use of CAM, research abstracts, and bibliographies.

<http://nccam.nih.gov>

National Council against Health Fraud. Provides news and information about health fraud and quackery and links to related sites.

<http://www.ncahf.org>

See also the listings for Chapters 2 and 12; the box about dietary supplements in Chapter 12 suggests websites with more information about supplements.

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BEHAVIOR CHANGE STRATEGY

Adhering to Your Physician's Instructions

Even though we sometimes have to entrust ourselves to the care of medical professionals, that doesn't mean we give up responsibility for our own behavior. Following medical instructions and advice often requires the same kind of behavioral self-management that's involved in quitting smoking, losing weight, or changing eating patterns. For example, if you have an illness or injury, you may be instructed to take medication at certain times of the day, do special exercises or movements, or change your diet.

The medical profession recognizes the importance of patient adherence and encourages different strategies to support it, such as the following:

1. Use reminders placed at home, in the car, at work, on your computer screensaver, or elsewhere that improve follow-through in taking medication and keeping scheduled appointments. To help you remember to take medications,
 - Link taking the medication with some well-established routine, like brushing your teeth or eating breakfast.
 - Use a medication calendar, and check off each pill.
 - Use a medication organizer or pill dispenser.
 - Plan ahead; don't wait until the last pill to get a prescription refilled.
2. Use a journal or another form of self-monitoring to keep a detailed account

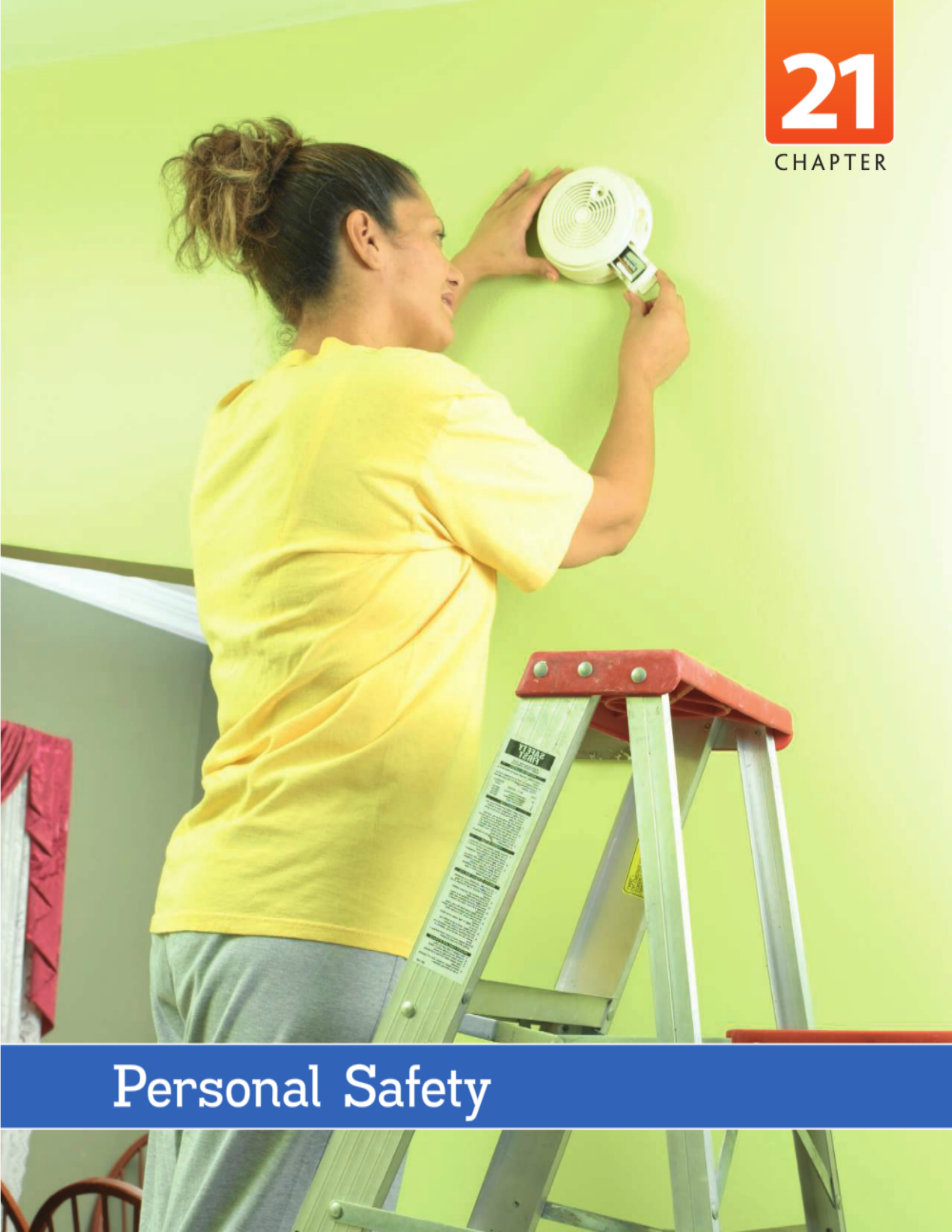


of your health-related behaviors, such as taking pills on schedule, following dietary recommendations, following an exercise program, and so on.

3. Use a self-reward system so that desired behavior changes are encouraged, with a focus on short-term rewards.
4. Develop a clear image or explanation of how the medication or behavior change will improve your health, how you will look and feel, and your long-term well-being.

If these strategies don't help you stick with your treatment plan, you may need to consider other possible explanations

for your lack of adherence. For example, are you confused about some aspect of the treatment? Do you find the schedule for taking your medications too complicated, or do the drugs have bothersome side effects that tempt you to avoid them? Do you feel that the recommended treatment is unnecessary or unlikely to help? Are you afraid of becoming dependent on a medication or that you'll be judged negatively if people know about your condition or treatment? A follow-up discussion with a health professional (your physician, a dietician, or a physical therapist) and an examination of your attitudes and beliefs about your condition and treatment plan can also help improve your adherence.



Personal Safety

LOOKING AHEAD...

After reading this chapter, you should be able to

- Identify factors that contribute to unintentional injuries
- List the most common types of unintentional injuries and strategies for preventing them
- Describe factors that contribute to violence and intentional injuries
- Discuss different forms of violence and how to protect yourself from intentional injuries
- List strategies for helping others in an emergency situation

TEST YOUR KNOWLEDGE

1. More people are injured each year through intentional acts of violence than through unintentional injuries (accidents).
True or false?
2. You should not wear a safety belt because, in a collision, your car might catch on fire or become submerged in water.
True or false?
3. Your odds are greatest for being killed in
 - a. A fire
 - b. A fall
 - c. A plane crash
4. Talking on a cell phone or texting while driving increases the risk of motor vehicle crashes.
True or false?
5. About what percentage of sexual assaults against women are committed by strangers?
 - a. 20%
 - b. 40%
 - c. 80%

ANSWERS

1. **FALSE.** Your lifetime odds of dying from an unintentional injury are 1 in 31, while the odds of your being murdered are 1 in 211.
2. **FALSE.** These kinds of crashes are rare, and the greatest danger is the impact that precedes them.
3. **B.** The odds of being fatally injured in a fall are estimated at 1 in 171. The odds of being killed by fire are 1 in 1,177, and the odds of dying in a plane crash are 1 in 7,032.
4. **TRUE.** Using either a handheld or a hands-free cell phone while driving decreases attentiveness and reaction time, as does texting. A 20-year-old using a phone has the reaction time of a 70-year-old not using one.
5. **A.** The vast majority of sexual assaults against women are committed by friends, acquaintances, or intimate partners.

Each year more than 185,000 Americans die from injuries, and many more are temporarily or permanently disabled. The economic cost of injuries is high, with nearly \$700 billion spent each year for medical care and rehabilitation of injured people.

Injuries also cause emotional suffering for injured people and their families, friends, and colleagues.

Luckily many steps can be taken to reduce the risk of injuries. Engineering strategies such as safety belts can help lower injury rates, as can the passage and enforcement of safety-related laws, such as those requiring tamper-proof containers for OTC medications. Public education campaigns about risky behaviors such as driving under the influence of alcohol or smoking in bed can also help prevent injuries.

Ultimately, though, it is up to each person to take responsibility for his or her actions and make wise choices about

safety behaviors. Many of the same sensible attitudes, responsible behaviors, and informed decisions that optimize your wellness can improve your chances of avoiding injuries. This chapter explains how you can protect yourself and those around you from becoming the victims of unintentional and intentional injuries.

DIFFERENTIATING INJURIES

Injuries can be intentional or unintentional. An **intentional injury** is one that is purposely inflicted by oneself or by another person. If an injury occurs when no harm is intended, it is considered an **unintentional injury**. Motor vehicle crashes, falls, and fires often result in unintentional injuries. (Note that public health officials prefer not to use the word *accidents*

to describe unintentional injuries because it suggests events beyond human control. *Injuries* are predictable outcomes of factors that can be controlled or prevented.)

Although Americans tend to express more concern about intentional injuries, unintentional injuries are actually far more common. Unintentional injuries are the fifth leading cause of death among all Americans and the leading cause of death among children and young adults.

Because unintentional injuries are so common, they account for more **years of potential life lost** than any other cause of death.

UNINTENTIONAL INJURIES

Unintentional injuries are the leading cause of death in the United States for people under age 45. Injury situations are generally categorized into four general classes, based on where they occur: motor vehicle injuries, home injuries, leisure injuries, and work injuries. The greatest number of deaths occur in motor vehicle crashes, but the greatest number of disabling injuries occur in the home, with falls being the leading cause of nonfatal, unintentional injuries that are treated in hospital emergency departments (Table 21.1). In all of these arenas, the action you take can mean the difference between injury or death and no injury at all.

What Causes an Injury?

Most injuries are caused by a combination of human and environmental factors. Human factors are inner conditions or attitudes that lead to an unsafe state, whether physical, emotional, or psychological. Environmental factors are external conditions and circumstances, such as poor road conditions, a slippery surface, or the undertow of the ocean at the beach.

A common human factor that leads to injuries is risk-taking behavior. People vary in the amount of risk they tend to take in life, but young men are especially prone to taking risks (see the box “Injuries among Young Men”). Some people take risks to win the admiration of their peers. Other people simply overestimate their physical abilities. Alcohol and drug use is another common risk factor that leads to many injuries and deaths.

Psychological and emotional factors can also play a role in injuries. People sometimes act on the basis of inadequate or inaccurate beliefs about what is safe or unsafe. For example, a person who believes that safety belts trap people in cars when a crash occurs and who therefore decides not to wear a safety belt is acting on an inaccurate belief. However, many people who have accurate information still decide to engage in risky behavior. Young people often have unsafe attitudes, such as “I won’t get hurt” or “It won’t happen to me.” Attitudes like this can lead to risk taking and ultimately to injuries.

Table 21.1

Unintentional Injuries in the United States (2009)

	DEATHS	DISABLING INJURIES
Motor vehicle	35,900	3,300,000
Home	65,200	21,100,000
Leisure	25,100	9,400,000
Work	3,582	5,100,000
All classes*	128,200	38,900,000

*Deaths and injuries for the four separate classes total more than the “All classes” figures because of rounding and because some deaths and injuries are included in more than one class.

SOURCE: National Safety Council. 2011. *Injury Facts, 2011 Edition*. Itasca, IL: National Safety Council.

QUICK

STATS

Motor vehicle injuries cost Americans \$245 billion in 2009.

—NSC, 2011

Environmental factors leading to injury may be natural (weather conditions), social (a drunk driver), work-related (defective equipment), or home-related (faulty wiring). Making the environment safer is an important aspect of safety. Laws are often passed to try to make our environment safer. Examples include speed limits on highways and workplace safety requirements.

Motor Vehicle Injuries

According to the National Safety Council (NSC), nearly 36,000 Americans were killed and nearly 3.3 million injured in motor vehicle crashes in 2009. Worldwide, motor vehicle crashes kill 1.2 million and injure up to 50 million people each year, making motor vehicle injuries the 11th leading cause of death overall. Those most affected by motor vehicle crashes are people aged 15–24. It is more likely that your death will be caused by a motor vehicle crash than by any other type of unintentional or intentional injury (Table 21.2). **Motor vehicle injuries** also result in the majority of cases of paralysis due to spinal injuries, and they are the leading cause of severe brain injury in the United States.

intentional injury An injury that is purposely inflicted by either oneself or another person.

unintentional injury An injury that occurs without harm being intended.

years of potential life lost The difference between an individual’s life expectancy and his or her age at death.

motor vehicle injuries Unintentional injuries and deaths involving motor vehicles in motion, both on and off the highway or street; incidents causing motor vehicle injuries include collisions between vehicles and collisions with objects or pedestrians.

TERMS



DIVERSITY MATTERS

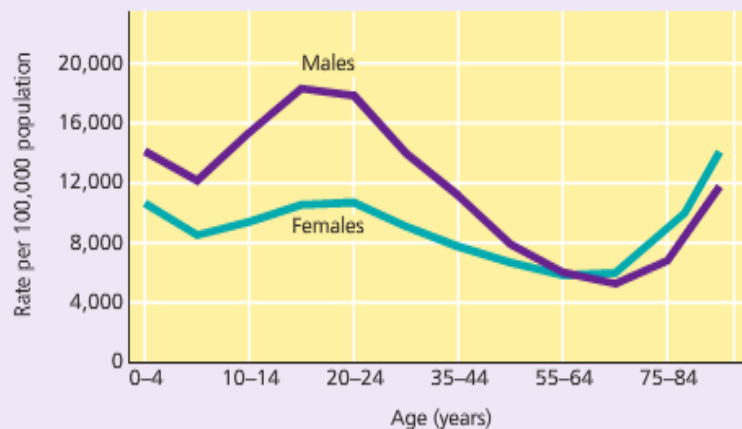
Injuries among Young Men

Overall, rates of injury are highest among young adults and seniors over age 85. Except among the oldest group of adults, the non-fatal injury rate is substantially higher in males than in females—and it peaks among young adult males (see figure). Males also significantly outnumber females in injury deaths, whether unintentional or intentional.

Why do men, especially young men, have such high rates of injury? Gender roles may be a key factor: traditional gender roles for males may associate masculinity with risk-taking behavior and a disregard for pain and injury, and risk-taking behavior may be particularly common among young men. Men are more likely to drive dangerously, drink and drive, binge-drink, and use aggressive behavior to control situations—all of which can lead to higher rates of fatal and nonfatal injury. Men may also have a lower perception of risk of dangerous behaviors compared with women.

Traditional gender roles may also make it more difficult for men to admit to injury or emotional vulnerability. Physical injuries may worsen or become chronic if care is not sought promptly. Untreated depression can lead to suicide.

In addition, men may have greater exposure to some injury situations. Compared with women, men may drive more miles, have greater access to firearms, and



Nonfatal injury rate by age and sex.

be more likely to ride motorcycles, operate machinery, and have jobs associated with high rates of workplace injuries. They may be more likely to engage in sports and other recreational activities that are associated with high rates of injuries. Greater access to and use of firearms plays a role in higher rates of deaths among men from assault and suicide. As described in Chapter 3, women are more likely than men to attempt suicide, but men are much more likely to succeed, primarily because they are more likely to use firearms.

Some researchers suggest that the male hormone testosterone may play a

role in risky and aggressive behavior. Differences in brain structure and activity may also influence how men and women respond to stressors and how quickly and to what degree they become verbally or physically aggressive in response to anger.

SOURCES: Centers for Disease Control and Prevention. 2004. Surveillance for fatal and nonfatal injuries—United States, 2001. *MMWR Surveillance Summaries* 53(SS07): 1–57; World Health Organization. 2002. *Gender and Road Traffic Injuries*. Geneva: World Health Organization; Courtenay, W. 1998. College men's health: an overview and a call to action. *Journal of American College Health* 46(6): 279–290.

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Factors Contributing to Motor Vehicle Injuries

Common causes of motor vehicle injuries are speeding, aggressive driving, fatigue, inexperience, cell phones and other distractions, the use of alcohol and other drugs, and the incorrect use of safety belts and other safety devices.

SPEEDING Nearly 63% of all motor vehicle crashes are caused by bad driving behaviors, especially speeding. As speed increases, momentum and the force of impact increase, and the time allowed for the driver to react (reaction time) decreases. Speed limits are posted to establish the safest maximum speed limit for a given area under ideal conditions; if visibility is limited or the road is wet, the safe maximum speed may be considerably lower. Many states have raised their highway speed limits since the 1995 repeal of the National Maximum Speed Limit, and overall motor vehicle fatalities have since increased. Raising speed limits on rural interstates contributed to a 35% increase in crash death rates.

AGGRESSIVE DRIVING Speeding is also a hallmark of aggressive drivers—those who operate motor vehicles in an unsafe and hostile manner. Aggressive driving, also known as road rage, has increased more than 50% since 1990, and one in four U.S. drivers admits to driving aggressively at least some of the time. Other characteristics of aggressive driving include frequent, erratic, and abrupt lane changes; tailgating; running red lights or stop signs; passing on the shoulder; and blocking other cars trying to change lanes or pass. Aggressive drivers increase the risk of crashes for themselves and others. Injuries may also occur if aggressive drivers stop their vehicles and confront each other following an incident. For more about aggressive driving, take the quiz and review the strategies in the box “Are You an Aggressive Driver?”

FATIGUE AND SLEEPINESS Driving requires mental alertness and attentiveness. Studies have shown that sleepiness causes slower reaction times, reduced coordination and vigilance,

VITAL STATISTICS

Table 21.2 Lifetime Odds of Death Due to Injury

Motor vehicle	1 in 98
Poisoning	1 in 126
Fall	1 in 163
Car occupant	1 in 368
Pedestrian	1 in 701
Drowning	1 in 1,103
Fire	1 in 1,344
Firearm discharge	1 in 6,609
Electric current	1 in 12,420
Exposure to natural heat	1 in 13,217
Cataclysmic storm	1 in 29,196
Hornet/bee/wasp sting	1 in 79,842
Earthquake or volcano	1 in 97,807
Lightning	1 in 134,906
Suicide	1 in 109
Homicide (assault by firearm)	1 in 321

SOURCE: National Safety Council. 2011. *Lifetime Odds of Deaths for Selected Causes*, U.S. Itasca, IL: National Safety Council.

and delayed information processing. Drowsiness can be caused by not getting enough hours of sleep, by sleep disorders that prevent sleep from being refreshing, or by disruptions caused by shift work that force people to sleep at odd hours. Research shows that even mild sleep deprivation causes a deterioration in driving ability comparable to that caused by a 0.05% blood alcohol concentration—a level considered hazardous when driving. Being awake for 18 hours can impair driving ability as much as drinking two alcoholic beverages.

CELL PHONES AND OTHER DISTRACTIONS Anything that distracts a driver can increase the risk of a motor vehicle injury. Common distractions include talking to someone on a cell phone or in the vehicle, texting, eating, smoking, and reaching for controls in the car. Objects and activities outside the vehicle are a source of distraction, as well. In fact, with the recent development of digital billboards, more than a dozen U.S. cities have banned them because of their potential to distract drivers.

Several common causes of crashes, such as disregarding stop signs, have been linked to driver distraction. Distraction is a contributing factor in 25–50% of all crashes. About 70% of distracted driver crashes involve noncollision (single-vehicle) or rear-end crashes.

Cell phones are a widely documented source of distraction for drivers. One highly regarded study showed that drivers who use cell phones are four times as likely to be involved in a crash as drivers who don't, primarily because the distraction increases reaction times.

Estimates provided by the National Safety Council attribute 1.3 million traffic crashes (about 23% of all crashes) to the use of cell phones. So far, nine states (California, Connecticut, Delaware, Maryland, New Jersey, Nevada,

New York, Oregon, and Washington) the District of Columbia, and the U.S. Virgin Islands have banned the use of handheld phones while driving. Other states are considering similar legislation. In 30 states and the District of Columbia, novice drivers are banned from using either handheld or hands-free cell phones while driving (see the box "Cell Phones, Texting, and Distracted Driving"). Thirty-five states, the District of Columbia, and Guam now ban all drivers from text messaging while driving; another eight states have no-texting laws that apply specifically to novice drivers. Given increasing concerns about distractions when driving, the National Transportation Safety Board (NTSB) recommended in December of 2011 that there be a full ban on use of portable electronic devices (including cell phones) while driving. Drivers could still use their GPS navigation systems and their cell phones in emergency situations. No action has been taken yet regarding that recommendation.

ALCOHOL AND OTHER DRUGS Alcohol is involved in about one-third of all fatal crashes. Alcohol-impaired driving is illegal in all states and the District of Columbia. The legal limit for blood alcohol concentration (BAC) is 0.08%, but people can be impaired at much lower BACs. A driver with a BAC between 0.05% and 0.09% is nine times more likely to have a crash than a person who has not been drinking. The combination of fatigue and alcohol use increases the risk even further. Because alcohol affects reason and judgment as well as the ability to make fast, accurate, and coordinated movements, a person who has been drinking will be less likely to recognize that he or she is impaired.

Other substances also affect judgment and driving ability. A recent study found that hay fever sufferers who had taken diphenhydramine (an antihistamine found in over-the-counter allergy medications such as Benadryl) were as impaired as if they were legally drunk. Use of many over-the-counter and all psychoactive drugs is potentially dangerous if you plan to drive (see Chapters 9 and 10).

SAFETY BELTS, AIR BAGS, AND CHILD SAFETY SEATS The improper use of safety belts, air bags, and child safety seats contributes to injuries and deaths in motor vehicle crashes. Although mandatory safety belt laws are in effect in 49 states (excluding New Hampshire) and the District of Columbia, only about 85% of motor vehicle occupants used safety belts in 2010, even though they are the single most effective way to reduce the risk of crash-related death. Of drivers not wearing safety belts who have been killed in automobile crashes, an estimated 60–70% would have survived if they had been wearing one.

Some people think that if they are involved in a crash they are better off being thrown free of their vehicle. In fact, the chances of being killed are 25 times greater if you are thrown from a vehicle, whether it is due to injuries caused by hitting a tree or the pavement or by being hit by another vehicle. Safety belts not only prevent you from being thrown from the car at the time of the crash but also provide protection from second collisions: If a car is traveling at 65 mph and hits another vehicle, the car stops first; then the occupants stop because they, too, are traveling at 65 mph. The second collisions



ASSESS YOURSELF

Are You an Aggressive Driver?

To find out if you are an aggressive driver, check any of the following statements that are true for you:

- _____ I consistently exceed the speed limit; I'm often unaware of both my speed and the speed limit.
- _____ I frequently follow closely behind the car in front of me.
- _____ If I feel the car in front of me is going too slowly, I tailgate.
- _____ I change lanes frequently to pass people.
- _____ I seldom use my turn signals when changing lanes or turning.
- _____ I often run red lights or roll through stop signs.
- _____ I react to what I feel is another driver's mistake by cursing, shouting, or making rude gestures; by blocking a car from passing or changing lanes; by using high beams; or by braking suddenly in front of a tailgater.
- _____ My personality changes and I become more competitive when I get behind the wheel.
- _____ I often get angry or impatient with other drivers and with pedestrians.
- _____ I would consider pulling over for a personal encounter with a bad driver.

Each of these statements is characteristic of aggressive drivers; the more items you checked, the greater your road rage. If you checked even one statement, consider taking some of the following steps to reduce your hostility behind the wheel:

- Allow enough time for your trip to reach your destination without speeding.



- Avoid driving during periods of heavy traffic.
- Don't drive when you are angry, tired, or intoxicated.
- Imagine that the other drivers are all people that you know and like. Be courteous and forgiving.
- Listen to soothing music or a book on tape, or practice a relaxation technique such as deep breathing (see Chapter 2).
- Take a course in anger management.

Even if you control your own aggressive impulses, you may still encounter an aggressive driver on the road. The AAA Foundation for Traffic Safety recommends the following strategies:

- Avoid behaviors that may enrage an aggressive driver; these include cutting off cars when merging, driving slowly in the left lane, tailgating, and making rude gestures.
- If you make a mistake while driving, apologize. In surveys, the most popular and widely understood gestures for apologies include raising or waving a hand and touching or knocking the head with the palm of your hand (to indicate "What was I thinking?").
- Refuse to join in a fight. Avoid eye contact with an angry driver, and put distance between your car and his or her vehicle. If you think another driver is following you, call the police on a cell phone or drive to a public place.

SOURCES: New York State Department of Motor Vehicles. 2010. *Aggressive Driving* (www.safety.ny.gov); AAA Foundation for Traffic Safety. 1997. *Road Rage: How to Avoid Aggressive Driving* (www.aaafoundation.org/pdf/roadrage.pdf)

occur when occupants hit something inside the car, such as the dashboard or windshield. The safety belts stop these second collisions from occurring and spreads the first collisions' force over the occupants' bodies.

Since 1998 all new cars and light trucks have been equipped with dual air bags—one for the driver and one for the front passenger. Many vehicles also offer side air bags, which further reduce the risk of injury. Advanced air bag systems include risk reduction technologies such as sensors to detect crash severity, seat position, passenger size, and whether a passenger is wearing a safety belt. Although air bags provide supplementary protection in the event of a collision, most are useful only in head-on collisions. They also deflate immediately after inflating and therefore do not provide protection in collisions

Air bags are not a replacement for safety belts; everyone in a vehicle should buckle up.

involving multiple impacts. Air bags are not a replacement for safety belts; everyone in a vehicle should buckle up.

Air bags deploy forcefully and can injure a child or short adult who is improperly restrained or sitting too close to the dashboard, although second-generation air bags are somewhat safer for children than older devices. To ensure that air bags work safely, always follow these basic guidelines: Place infants in rear-facing infant seats in the back seat, transport children aged 12 and under in the back seat, always use safety belts and appropriate safety seats, and keep 10 inches between the air bag cover and the breastbone of the driver or passenger. If necessary, adjust the steering wheel or use seat cushions to ensure that an inflating air bag will hit a person in the chest and not in the face.

WELLNESS ON CAMPUS

Cell Phones, Texting, and Distracted Driving



At any given moment, about 9% of U.S. drivers are talking on a cell phone. To put that into perspective, a recent telephone survey of 18- to 24-year-olds revealed over 50% of them use their cell phones daily or several times a week while driving.

Available evidence indicates that the distraction of using a cell phone while driving increases the risk of motor vehicle crashes. In a study using a driver training simulator, cell phone users were about 20% slower to respond to sudden hazards than were other drivers, and they were about twice as likely to rear-end a braking car in front of them. Among young adult drivers who used cell phones, reaction time was reduced to the level of a 70-year-old driver who was not using a phone.

More people are now being observed texting while driving, which is potentially more dangerous because most individuals need to look directly at the screen of their handheld devices to send and read messages. Results of a study of college-age students texting while operating a driving simulator revealed their risk of crashing was multiplied by a factor of 8 (compared to a group of college-aged cell phone users whose risk had increased by a factor of 4).

Several states have banned the use of cell phones while driving and even more prohibit the use of text messages or e-mail. Although legal in some states, the safest strategy is not to use your phone for calling or texting while driving. For people who live where cell phone use is legal while driving and who choose to use a phone, the following strategies may help increase safety:



- Be familiar with your phone and its functions, especially speed dial and redial.
- Store frequently called numbers on speed dial so you can place calls without looking at the phone.
- If your phone has voice-activated dialing, use it.
- Use a hands-free device so you can keep both hands on the steering wheel.
- Let the person you are speaking to know you are driving and be prepared to end the call at any time.
- Don't place or answer calls in heavy traffic or hazardous weather conditions.
- Don't take notes or look up phone numbers while driving.
- Time calls so you can place them when you are at a stop.

Any kind of distraction—visual, manual, or cognitive—can contribute to an unsafe driving situation. More and more college students have cell phones today, so their use when driving is a growing concern that warrants further attention.

SOURCES: AAA Foundation for Traffic Safety. 2009. *Safety Culture: Text Messaging and Cell Phone Use While Driving* (www.aaafoundation.org/pdf/TextingFS091012.pdf); TXTResponsibly. 2012. *Gauging Your Distraction* (www.txtresponsibly.org/resources/tools/); National Safety Council. 2012. *Distracted Driving* (www.nsc.org/safety_road/Distracted_Driving/Pages/distracted_driving.aspx).

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Another adjustment should be made for children who have outgrown child safety seats but are still too small for adult safety belts alone (usually age 4–8). These children should be secured using booster seats that ensure that the safety belt is positioned low across the waist. About 45% of injured children are not properly restrained in the vehicle. All 50 states and the District of Columbia have child restraint laws, and more than 30 states mandate the use of booster seats for children who are too big for child safety seats. Before driving with a child, make sure that you know your state's laws, that you have an appropriate safety seat for the child, that the seat is installed correctly, and that the child is properly secured in the seat.

Preventing Motor Vehicle Injuries About 75% of all motor vehicle collisions occur within 25 miles of home and at speeds lower than 40 mph. Strategies for preventing motor vehicle injuries include the following:

- Obey the speed limit. If you have to speed to get somewhere on time, you're not allowing enough time.

- Always wear a safety belt. The shoulder strap should cross the collarbone, and the lap belt should fit low and snug across the hips and pelvic area. The shoulder strap should never be slipped under the arm or behind the back. Pregnant women should position the lap belt as low as possible on the pelvic area.
- Never drive under the influence of alcohol or other drugs, and never ride with a driver who is.
- Keep your car in good working order.
- Always allow enough following distance. Use the three-second rule: When the vehicle ahead passes a reference point, count out three seconds [say 1001, 1002, 1003]. If you pass the reference point before you finish counting, drop back and allow more following distance. This rule works well at slower speeds when roads are dry and weather conditions are good. When traveling on highways or the interstate, use the four-second rule.
- Always increase your following distance and slow down if weather or road conditions are poor. In

those kinds of situations, the minimum recommendation is to follow four seconds behind the car in front of you.

- Choose interstate highways rather than rural roads. Highways are much safer because of better visibility, wider lanes, fewer surprises, and other factors.
- Always signal when turning or changing lanes.
- Stop completely at stop signs. Follow all traffic laws.
- Take special care at intersections. Look left, right, and then left again. Make sure you have time to complete your maneuver in the intersection.
- Don't pass on two-lane roads unless you're in a designated passing area and have a clear view ahead.

Motorcycles and Motorized Scooters About one out of every seven traffic fatalities among people aged 15–34 involves someone riding a motorcycle. In more than two-thirds of crashes involving a car and a motorcycle, the driver of the car is at fault. Injuries from motorcycle collisions are generally more severe than those involving automobiles because motorcycles provide little, if any, protection. Because head injuries are the major cause of death, the use of a helmet is critical for rider safety. This is why nearly all states (except Illinois, Iowa, and New Hampshire) have helmet laws. Still, fewer than 50% of motorcyclists wear helmets that meet safety standards. Riders also need to know how to operate a motorcycle safely; operator error is a factor in approximately 75% of fatal motorcycle crashes.

People riding motorized scooters face additional challenges. Such vehicles usually have a maximum speed of 30–35 mph and have less power for maneuverability, especially in an emergency. Drivers should use caution and learn how to handle these vehicles in traffic.

Additional strategies for preventing motorcycle and motor scooter injuries include the following:

- Wear light-colored clothing, drive with your headlights on, and correctly position yourself in traffic.
- Develop the necessary skills. Lack of skill is a major factor in motorcycle and motor scooter injuries. Skidding from improper braking is the most common cause of loss of control.
- Wear a helmet. Helmets should be marked with the DOT symbol, certifying that they conform to federal safety standards established by the Department of Transportation. Helmet use is required by law in most states.
- Protect your eyes with goggles, a face shield, or a windshield.
- Drive defensively, particularly when changing lanes and at intersections, and never assume that other drivers can see you.

Bicycles Bicycle injuries result primarily from riders not knowing or understanding the rules of the road, failing to follow traffic laws, not having sufficient skill or experience to handle traffic conditions, or being intoxicated. Bicycles are considered vehicles; bicyclists must obey all traffic laws that apply to automobile drivers, including stopping at traffic lights and stop signs.

Head injuries are involved in about two-thirds of all bicycle-related deaths. Currently 22 states, the District of Columbia, and nearly 200 cities have laws requiring cyclists to wear helmets. Wearing a helmet reduces the risk of head injury by 85% (see the box “Choosing a Bicycle Helmet”). Safe cycling strategies include the following:

- Wear safety equipment, including a helmet, eye protection, gloves, and proper footwear. Secure the bottom of your pant legs with clips, and secure your shoelaces so they don't get tangled in the chain.
- Wear light-colored, reflective clothing. Equip your bike with reflectors, and use lights, especially at night or when riding in wooded or other dark areas.
- Ride with the flow of traffic, not against it, and follow all traffic laws. Use bike paths when they are available.
- Ride defensively; never assume that drivers have seen you. Be especially careful when turning or crossing at corners and intersections. Watch for cars turning right.
 - + Stop at all traffic lights and stop signs. Know and use hand signals.

QUICK STATS
About 54% of all injuries that require medical attention occur in the home.

—NSC, 2011

Pedestrians Pedestrians are no match for motor vehicles. About one in eight motor vehicle deaths involves pedestrians, and more than 60,000 pedestrians are injured each year. The highest rates of death and injury occur among the very young and the elderly. About 75% of pedestrian deaths occur

when people cross or enter the roadway between intersections. Alcohol intoxication plays a significant role in up to half of all adult pedestrian fatalities.

The following strategies can help prevent injuries when you're walking or jogging:

- Walk or jog in daylight.
- Wear light-colored, reflective clothing.
- Face traffic when walking or jogging along a road, and follow traffic laws.
- Avoid busy roads or roads with poor visibility.
- Cross only at marked crosswalks and intersections.
- Don't use headphones while walking.
- Don't hitchhike—it places you in a potentially dangerous situation.

Home Injuries

A person's place of residence, whether a house, an apartment, a trailer, or a dormitory, is considered home. People

CRITICAL CONSUMER

Choosing a Bicycle Helmet



Wearing a bicycle helmet can help you avoid serious head injury, brain damage, or even death in the event of a collision or fall. Helmets have a layer of stiff foam, which absorbs shock and cushions a blow to your head, covered by a thin plastic shell that will skid along the ground. For maximum protection, it's important to select a correctly fitting helmet. When you go shopping, remember the four S's: size, strap, straight, and sticker.

- **Size:** Try on several different sizes before making your selection; it may take several tries before you find the most comfortable fit. The helmet should be very snug but not overly tight on your head. Pads are usually provided to help adjust the fit. A good salesperson can also help you get the right fit. When the helmet is strapped onto your head, it should not move more than an inch in any direction, and you should not be able to pull or twist it off no matter how hard you try.
- **Strap:** Be sure that the chin strap fits snugly under your chin and that the V in the strap meets under your ear. Avoid thin straps, which can be uncomfortable. Be sure that the buckle is strong and won't pop open and that the straps are sturdy.
- **Straight:** The helmet should sit straight on your head, not tilted back or forward. A rule of thumb is that the rim should be about two finger widths above your eyebrows (depending on the height of your forehead).
- **Sticker:** Helmets sold in the United States must meet uniform safety standards established by the



U.S. Consumer Product Safety Commission (CPSC). Look for a sticker or label that says the helmet meets the CPSC standard. If a helmet does not have one, it does not meet federal safety standards and should not be used.

You are more likely to wear your helmet if it is comfortable, so be sure that vents on the helmet provide airflow to promote cooling and sweat control. You will be safer with a brightly colored helmet that makes you more visible to drivers, especially in rainy, foggy, or dark conditions. Reflective tape will also increase your visibility. Finally, a helmet is a good place to put emergency information (your name, address, and phone number, plus any emergency medical conditions and an emergency contact).

If you are involved in a crash, replace your helmet. Even if the helmet doesn't have any visible signs of damage, its ability to protect your head may be compromised.

SOURCES: Bicycle Helmet Safety Institute. 2010. *A Buyer's Guide to Bicycle Helmets* (www.helmets.org/guide.htm); Bicycle Helmet Safety Institute. 2010. *How to Fit a Bicycle Helmet* (www.helmets.org/fit.htm).

spend a great deal of time at home and feel that they are safe and secure there. However, home can be a dangerous place. The most common fatal **home injuries** are the result of falls, fires, poisoning, suffocation, and unintentional shootings.

Falls Over 90% of fatal falls involve people aged 45 and over, but falls are a significant cause of unintentional death and injury for people under 25. Most deaths occurring from falls involve falling on stairs or steps or from one level to another.

home injuries Unintentional injuries and deaths that occur in the home and on home premises to occupants, guests, domestic servants, and trespassers; falls, burns, poisonings, suffocations, unintentional shootings, drownings, and electrical shocks are examples.

TERMS

other. Falls also occur on the same level, from tripping, slipping, or stumbling. Alcohol is a contributing factor in many falls. Strategies for preventing falls include the following:

- Install handrails and nonslip surfaces in the shower and bathtub.
- Keep floors, stairs, and outside areas clear of objects or conditions that could cause slipping or tripping, such as ice, snow, electrical cords, and toys.
- Put a light switch by the door of every room so no one has to walk across a room to turn on a light. Use night lights in bedrooms, halls, stairs, and bathrooms.
- When climbing a ladder, use both hands. Never stand higher than the third step from the top. When using a stepladder, make sure the spreader brace is in the locked position. With straight ladders, set the base out one foot for every four feet of height.

- Don't use chairs to reach things.
- If there are small children in the home, place gates at the top and bottom of stairs. Never leave a baby unattended on a bed or table. Install window guards to prevent children from falling out of windows.

Fires Approximately 85% of fire deaths and 65% of fire injuries occur in the home; a death caused by a residential fire occurs every 169 minutes. Most fires begin in the kitchen, living room, or bedroom. Cooking is now the leading cause of home fire injuries; careless smoking is the leading cause of fire deaths, followed by problems with heating equipment and arson.

To prevent fires, it's important to dispose of all cigarettes in ashtrays and to never smoke in bed. Other strategies include proper maintenance of fireplaces, furnaces, heaters, chimneys, and electrical outlets, cords, and appliances. If you use a portable heater, keep it at least three feet away from curtains, bedding, or anything else that might catch fire. Never leave heaters on unattended.

It's important to be adequately prepared to handle fire-related situations. Plan at least two escape routes out of each room, and designate a location outside the home as a meeting place. For practice, stage a home fire drill; do this at night because that's when most deadly fires occur.

Install smoke detectors on every level of your home. Your risk of dying in a fire is almost twice as high if you do not use them. Clean the detectors and check the batteries once a month, and replace the batteries at least once a year. Be sure that all residents are familiar with the sound of the smoke detector's alarm; when it goes off, take it seriously.

These strategies can help prevent injuries in a fire:

- Get out as quickly as possible, and go to the designated meeting place. Don't stop for a keepsake or a pet. Never hide in a closet or under a bed. Once outside, count heads to see if everyone is out. If you think someone is still inside the burning building, tell the firefighters. Never go back inside a burning building.
- If you're trapped in a room, feel the door. If it is hot or if smoke is coming in through the cracks, don't open it; use the alternative escape route. If you can't get out, go to the window and shout for help.
- Smoke inhalation is the largest cause of death and injury in fires. To avoid inhaling smoke, crawl along the floor away from the heat and smoke. Cover your mouth and nose, ideally with a wet cloth, and take short, shallow breaths.
- If your clothes catch fire, don't run. Drop to the ground, cover your face, and roll back and forth to smother the flames. Remember: stop-drop-roll.

Although house fires cause the most deaths, hot water causes the most nonfatal burns. Set your water heater no higher than 120°F. Young children are particularly at risk of

being burned. Place barriers around stoves and radiators, and keep young children out of the kitchen, where they might be burned by spills. Put pans on rear burners, and turn pot handles toward the back of the stove. Keep hot foods away from the edge of counters and tables, and don't put them on a tablecloth that a small child can pull. Always test the contents of a baby bottle; when bottles are heated in microwave ovens, the liquid can become scalding before the outside of the bottle gets hot.

Poisoning More than 2.5 million poisonings and over 39,000 poison-related deaths occur every year in the United States; nearly 75% of poison exposures are unintentional. Poisons come in many forms, some of which are not typically considered poisons.

For example, even honey can be poisonous to children less than a year old. Medications are safe when used as prescribed, but overdosing or incorrectly combining medications with another substance may result in poisoning. Other poisonous substances include cleaning agents, petroleum-based products, insecticides and herbicides, cosmetics, nail polish and remover, and many houseplants. All potentially poisonous substances should be used only as directed and stored out of the reach of children.

The most common type of poisoning by gases is carbon monoxide poisoning. Carbon monoxide gas is emitted by motor vehicle exhaust and some types of heating equipment. The effects of exposure to this colorless, odorless gas include headache, blurred vision, and shortness of breath, followed by dizziness, vomiting, and unconsciousness. Carbon monoxide detectors (similar to smoke detectors) are available for home use; they should be used according to the manufacturer's instructions. To prevent poisoning by gases, never operate a vehicle in an enclosed space, have your furnace inspected yearly, and use caution with any substance or device that produces potentially toxic fumes.

Keep the national poison control hotline number (800-222-1222) in a convenient location. A call to the national hotline will be routed to a local poison control center, which provides expert emergency advice 24 hours a day. If a poisoning occurs, it's important that you act quickly. Remove the poison from contact with the victim's eyes, skin, or mouth, or move the victim away from contact with poisonous gases. Call the poison control center immediately for instructions; do not follow the emergency instructions on product labels because they may be incorrect. Depending on the situation, you may be instructed to give the victim water to drink, or to flush affected parts of the skin or eyes with water. Do not induce vomiting. If you are advised to go to a hospital emergency department, take the poisonous substance or container with you.

Suffocation and Choking Suffocation and choking account for over 6,000 deaths annually. Children can suffocate if they put small items in their mouth, get tangled in their

QUICK STATS

87 firefighters died in the line of duty in 2011 in the United States.

—U.S. Fire Administration, 2011

crib bedding, or get trapped in airtight appliances like old refrigerators. Keep small objects out of reach of children under age 3, and don't give them raw carrots, hot dogs, popcorn, gum, or hard candy. Examine toys carefully for small parts that could come loose. Don't give plastic bags or balloons to small children.

Adults can also become choking victims, especially if they fail to chew food properly, eat hurriedly, or try to talk and eat at the same time. Many choking victims can be saved with the **Heimlich maneuver**. The American Red Cross recommends abdominal thrusts as the easiest and safest thing to do when an adult is choking. Back blows in conjunction with abdominal thrusts are an acceptable procedure for dislodging an object from the throat of an infant.



ATV injuries and fatalities have increased over the past decade, with the highest rates of injury and death in children under 16. Wearing a helmet is the single most important safety measure for ATV users.

Firearms Over 40% of all unintended firearm deaths and nonfatal injuries involve children and young adults under 25 years of age. People who use firearms should remember the following:

- Always treat a gun as though it were loaded, even if you know it isn't.
- Never point a gun—loaded or unloaded—at anything you do not intend to shoot.
- Always unload a gun before storing it. Store unloaded firearms under lock and key, in a place separate from the ammunition.
- Always inspect firearms carefully before handling.
- If you ever plan to handle a gun, take a firearms safety course first.
- If you own a gun, buy and use a gun lock designed specifically for that weapon.

Proper storage is critical. Do not assume that young children cannot fire a gun. Even children as young as 3 can have enough finger strength to pull a trigger. Every year about 120 Americans are unintentionally shot to death by children under 6. About 8.3 million children live in households with unlocked guns, including 2.6 million who live in households where guns are stored loaded or with ammunition nearby.

Probably the best advice for anyone who picks up a gun is to assume it is loaded. Many deaths and injuries occur when someone handles a gun he or she believes is not loaded. If you plan to handle a gun, avoid alcohol and drugs, which affect judgment and coordination.

Leisure Injuries

Leisure activities encompass a large part of our free time, so it is not surprising that **leisure injuries** are a significant health-related problem in the United States. Key factors in leisure injuries include misuse of equipment, lack of experience and skill, use of alcohol or other drugs, and failure to use appropriate safety equipment. Specific safety strategies for activities associated with leisure injuries include the following:

- Don't swim alone, in unsupervised places, under the influence of alcohol, or for an unusual length of time. Use caution when swimming in unfamiliar surroundings or in water colder than 70°F. Check the depth of water before diving. Make sure that residential pools are fenced and that children are never allowed to swim unsupervised.

Heimlich maneuver A maneuver developed by Henry J. Heimlich, MD, to help force an obstruction from the airway.

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leisure injuries Unintentional injuries and deaths that occur in public places or places used in a public way, not involving motor vehicles; include most sports and recreation deaths and injuries; falls, drownings, burns, and heat and cold stress are examples.

- Always use a **personal flotation device** (also known as a life jacket) when on a boat.
- For all sports and recreational activities, make sure facilities are safe, follow the rules, and practice good sportsmanship. Develop adequate skill in the activity, and use proper safety equipment, including, where appropriate, a helmet, eye protection, correct footwear, and knee, elbow, and wrist pads.
- If using equipment such as skateboards, snowboards, mountain bikes, or all-terrain vehicles, wear a helmet and other safety equipment, and avoid excessive speeds and unsafe stunts. Playground equipment should be used only for those activities for which it is designed.
- If you are active in excessively hot and humid weather, drink plenty of fluids, rest frequently in the shade, and slow down or stop if you feel uncomfortable. (See the box “Extreme Weather and Personal Safety.”) Danger signals of heat stress include excessive perspiration, dizziness, headache, muscle cramps, nausea, weakness, rapid pulse, and disorientation.
- Do not use alcohol or other drugs during recreational activities—such activities require coordination and sound judgment.

For more about exercise safety, see Chapter 13.

In-Line Skating Injuries Although in-line skating is not as popular as it was just a few years ago, many Americans are still injured badly enough each year to end up in a hospital emergency department. Injuries to the wrist and head are most common; many occur because users do not wear appropriate safety gear. If you use in-line skates, wear a helmet, elbow and knee pads, wrist guards, a long-sleeved shirt, and long pants. Alcohol use appears to be a significant factor in in-line skating injuries that occur on college campuses. Because in-line skating involves skill, judgment, and coordination, it makes sense not to mix skating and drinking.

Weather-Related Injuries Although you can't control the weather, the best approach is to be prepared for whatever event may occur in your area. Even though conditions may seem harmless at times, they can become very dangerous.

- **Heat:** Extreme heat is the leading weather-related killer in the United States, according to the National Weather Service. Heat-related illness such as heat stroke and heat exhaustion can be fatal, especially for children, older adults, and people with certain health conditions. The best way to deal with excessive heat is to stay indoors as much as possible, with a fan or air conditioner on. Wear lightweight, light-colored clothing, drink plenty of water to stay hydrated, and avoid

heavy meals. If you must go out, move slowly and rest frequently in the shade. See Chapter 13 for advice on exercising in hot weather.

- **Cold:** Each year dozens of Americans die from exposure to cold temperatures. Conditions such as hypothermia (low body temperature) and frostbite (frozen skin or flesh) can be deadly. Most injuries and deaths in cold weather are due to a lack of preparedness or understanding of the dangers of low temperatures and wind chill. If you must go outdoors in very cold weather, dress in layers and cover your face, fingers, and ears to protect them from frostbite. Make sure your home and car are prepared with plenty of fuel, drinking water, warm clothes and blankets, batteries, and other emergency supplies. See Chapter 13 for advice on exercising in cold weather.

- **Wind:** Sustained winds as slow as 30 mph can make it difficult or impossible to walk or stand. In severe hurricanes and tornadoes, sustained winds near the storm's center can blow at speeds in excess of 200 mph—strong enough to sweep a house off its foundations. In extremely windy conditions, take cover in a sturdy shelter, preferably a permanent structure with a foundation. In a severe storm such as a tornado, move to the lowest portion of the building or to a small interior room away from windows. If you're outdoors when a severe storm or tornado strikes, lie flat in a low spot or ditch. Don't stay inside a car or hide under an open-sided structure such as a bridge; such structures can act as a funnel and make wind more intense.

- **Lightning:** About 300 Americans are struck by lightning every year, and about 10% of them die. Lightning can strike even when it's not raining, and it often strikes with no warning. If you hear thunder, you are close enough to the lightning's source to be struck. When conditions are right for lightning, go indoors. Stay out of water, even indoors, because water pipes can conduct electricity. Don't use corded telephones or appliances because their wiring can also conduct the power from a lightning strike.

- **Flooding:** Stay away from rapidly rising or moving water—it can carry you away in an instant. Even fairly shallow water can sweep a car away if the current is fast enough. If you're near rapidly rising water, move to higher ground and call for help. Don't attempt to drive or walk through flooded streets, and don't traverse a bridge if it is being pounded by high, fast-moving water. During heavy rain, stay alert for flash flood warnings and be ready to evacuate if necessary.

For a detailed discussion of environmental health—how the environment affects you and how you affect the environment—see Chapter 19.

Scooter Injuries Scooters are lightweight and have low-friction wheels for quickness and maneuverability. As their popularity has increased in the last 10 years, so have related injuries. The most common injuries are arm or hand fractures and dislocations, cuts and bruises, and sprains; 85% of injuries

personal flotation device A device designed to save a person from drowning by buoying up the body while in the water.

TERMS

involve children under the age of 15. Viewing scooters as toys more than transportation may lead riders to ignore important safety precautions:

- Wear a helmet that meets bicycle helmet standards, along with knee and elbow pads.
- Be sure that handlebars, the steering column, and all nuts and bolts are securely fastened.
- Ride on smooth, paved surfaces away from motor vehicle traffic. Avoid streets and surfaces with water, sand, gravel, or dirt.
- Don't ride after dark.
- Closely supervise young children.

Work Injuries

Since 1912, when industrial records were first kept in the United States, the work site has become a much safer place, as evidenced by a nearly 90% reduction in the unintentional death rate. That figure becomes even more impressive when you realize that the size of the labor force has more than doubled and production has increased more than tenfold. One very significant factor to account for such a marked decline in **work injuries** has been the Occupational Safety and Health Act of 1970. As a result of that act, the Occupational Safety and Health Administration (OSHA) was created within the U.S. Department of Labor to ensure a safer and healthier environment for workers.

According to the Bureau of Labor Statistics, 5.1 million Americans suffered injuries on the job in 2010. Certain types of injuries, including skin disorders and repetitive strain injuries, are increasing. Although laborers make up less than half of the workforce, they account for more than 75% of all work-related injuries and illnesses. Their jobs usually involve extensive manual labor and lifting, neither of which is addressed in OSHA safety standards. Skin disorders are the most commonly reported occupational illnesses; the introduction of more hazardous chemicals at the work site means that these disorders are of increasing concern. Most fatal occupational injuries involve crushing injuries, severe lacerations, burns, and electrocutions; among women, the leading cause of workplace injury deaths is homicide.

Back Injuries Back problems accounted for over 450,000 work injuries in 2009, although it is estimated

Laborers constitute less than half of the American workforce but suffer 75% of all work-related injuries.

work injuries Unintentional injuries and deaths that arise out of and in the course of gainful work, such as falls, electrical shocks, exposure to radiation and toxic chemicals, burns, cuts, back sprains, and loss of fingers or other body parts in machines.

TERMS



FIGURE 21.1 Correct lifting technique. Stay upright, bending at the knees and hips.

that twice as many workers experience some kind of minor back injury each year. According to the Bureau of Labor Statistics, back injuries account for 20% of all workplace injuries or illnesses. Many back injuries that occur on the job could be prevented through proper lifting technique (Figure 21.1).

- Avoid bending at the waist. Remain in an upright position and crouch down if you need to lower yourself to grasp the object. Bend at the knees and hips.
- Place feet securely about shoulder-width apart; grip the object firmly.
- Lift gradually, with straight arms. Avoid quick, jerky motions. Lift by standing up or pushing with your leg muscles. Keep the object close to your body.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Think of one injury you have suffered. What were you doing when you were injured? Thinking back on the injury, was there anything you could have done to avoid or minimize it? How did the experience change your attitudes or behaviors?



TAKE CHARGE

Repetitive Strain Injury

Repetitive strain injuries (RSIs) impact the musculoskeletal and nervous systems of the body and affect many people around the world. Other terms to describe this condition include *repetitive motion disorder (RMD)*, *cumulative trauma disorder (CTD)*, and *occupational overuse syndrome (OOS)*.

An RSI can be caused by a combination of physical and psychosocial stressors, but the injury typically involves some kind of repetitive action or forceful exertion on the body over time. Pain in the extremities as well as the back and shoulders is commonly cited and tends to worsen with extended activity.

The task associated with an RSI may be something relatively simple and nonexertive like typing, writing, or clicking a computer mouse. One of the most common work-related injuries is *carpal tunnel syndrome (CTS)*, which is characterized by pressure on the median nerve in the wrist that also affects tendons and ligaments in the forearm. Symptoms of CTS include numbness, tingling, burning, and/or aching in the hand, particularly in the thumb and the first three fingers. The pain may worsen at night and may shoot up from the hand as far as the shoulder. If it does not clear up on its own, immobilization of the joint at night can be helpful; other options may involve anti-inflammatory drugs or even surgery in extreme cases.

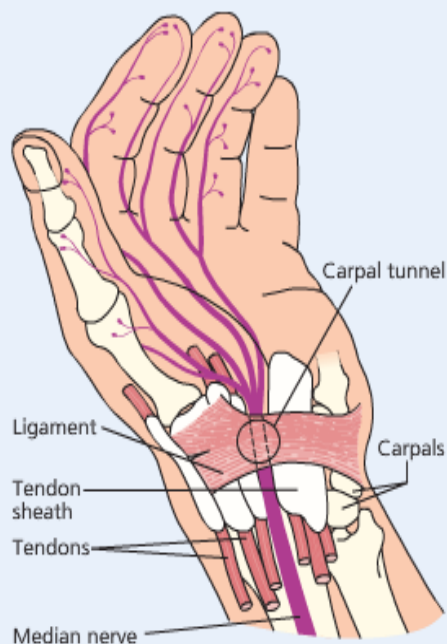
There are complex and more physically destructive examples of an RSI. If a person is operating a jackhammer, the vibration of the equipment and the position in which it must be operated are contributory factors often recognized for that RSI. In terms of physical activity by an athlete, examples include conditions commonly referred to as “golfer’s elbow” or “tennis elbow,” where the

joints are continually exposed to extreme stress in order to complete an action accurately with speed and force.

With new technologies being introduced every day, another type of RSI is now being recognized. Many people who use their thumbs to text are suffering from a condition referred to as “Blackberry thumb.” Similarly, people who spend countless hours using handheld controls to play video games are experiencing “gamer’s thumb.”

In all cases, research indicates the primary risk factors are usually associated with poor posture, improper techniques for completing a activity, and overusing a certain part of the body. The good news is that a person can make adjustments to reduce the risk of an RSI, either in terms of what is being done or through modification of the environment. Warm up your wrists before you begin any repetitive motion activity, and take frequent breaks to stretch and flex your wrists and hands:

- Extend your arms out in front of you and stretch your wrists by pointing your fingers to the ceiling; hold for a count of five. Then straighten your wrists and relax your fingers for a count of five.
- With arms extended, make a tight fist with both hands and then bend your wrists so your knuckles are pointed toward the floor; hold for a count of five. Then straighten your wrists and relax your fingers for a count of five.



Repeat these stretches several times, and finish by letting your arms hang loosely at your sides and shaking them gently for several seconds. It’s also important to maintain a physically active lifestyle, take plenty of breaks to avoid hours of sedentary activity, continue stretching during an activity, apply proper ergonomic principles, and try to minimize other stress factors.

- If you have to turn, change the position of your feet. Twisting is a common and dangerous cause of injury. Plan ahead so that your pathway is clear and turning can be minimized.
- Put the object down gently, reversing the steps for lifting.

Repetitive Strain Injuries Musculoskeletal injuries and disorders in the workplace include **repetitive strain injuries (RSIs)**. RSIs are caused by repeated strain on a particular part of the body. Twisting, vibrations, awkward postures, and other stressors may contribute to RSIs. **Carpal tunnel syndrome** is one type of RSI that has increased

in recent years due to increased use of computers, both at work and in the home (see the box “Repetitive Strain Injury” for more information).

repetitive strain injury (RSI) A musculoskeletal injury or disorder caused by repeated strain on the hand, arm, wrist, or other part of the body; also called *cumulative trauma disorder (CTD)*.

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carpal tunnel syndrome Compression of the median nerve in the wrist, often caused by repetitive use of the hands, such as in computer use; characterized by numbness, tingling, and pain in the hands and fingers; can cause nerve damage.

VIOLENCE AND INTENTIONAL INJURIES

Violence—the use of physical force with the intent to inflict harm, injury, or death upon oneself or another—is a major public health concern in the United States. According to the Federal Bureau of Investigation (FBI), over 1.3 million violent crimes occurred in the United States in 2009. Examples of violence are assault, homicide, sexual assault, domestic violence, suicide, and child abuse.

It is difficult to determine the overall level of violence in our society because the major sources of data, police reports and victim surveys, are often at odds. In comparison to other industrialized countries, U.S. rates of violence are unusually high in only two areas—homicide and firearm-related deaths. The U.S. homicide death rate is 4–10 times that of similar countries, and the firearm death rate is 8 times that of other developed countries.

Factors Contributing to Violence

Most intentional injuries and deaths are associated with an argument or the committing of another crime. However, there are many forms of violence, and no single factor can explain all of them.

Social Factors Rates of violence are not the same throughout society; they vary by geographic region, neighborhood, socioeconomic level, and many other factors. According to the FBI, violence was highest in the South in 2009, followed by the West. Neighborhoods that are disadvantaged in status, power, and economic resources are typically the ones with the most violence. Rates of violence are highest among young people and minorities, groups that have relatively little power. In 2009 people under age 25 accounted for 44% of the arrests for violent crime in the United States and 56% of the arrests for property crime.

People who feel a part of society (have strong family and social ties), who are economically integrated (have a reasonable chance at getting a decent job), and who grow up in areas where there is a feeling of community (good schools, parks, and neighborhoods) are significantly less likely to engage in violence. American society, where more than one-third of all children live in poverty and where the gap between rich and poor keeps growing, should be expected to breed violence. Many criminologists feel we have a growing underclass of people who cannot expect to have even the worst permanent jobs. That absence of hopes and dreams, combined with family devastation and poverty, certainly contributes to violent behavior.

Studies have shown that the environment on college campuses can contribute to violence. The nature of college campuses—transitory communities rather than permanent places where people work and live together over the long term—means that there is less incentive for people to cooperate and coexist amicably. Some campus groups even promote the ideas of bigotry and bias toward others, particularly toward

individuals about whom they know little or with whom they have had little contact. Ignorance and insensitivity to differences can be precursors to acts of violence.

Violence in the Media The mass media play a major role in exposing audiences of all ages to violence as an acceptable and effective means of solving problems. On the average, children in the United States watch about four hours of television daily and may view as many as 10,000 violent acts on television and in movies each year. Computer and video games also include many violent acts, leading to concern that children's exposure to violence will make them more accepting or tolerant of it. The consequences of violence are depicted much less frequently.

Researchers studying the links between TV viewing and bullying among children have found that the more hours per day a 4-year-old spent watching TV, the more likely the child was to engage in bullying behavior in later years. Factors that reduced the rate of bullying included cognitive stimulation, such as parents reading to a child, and emotional support and attention. It is thought that emotional support from parents helps children develop empathy, social competence, and self-regulation—skills that enable them to deal with peers without resorting to aggressive or bullying behavior.

Researchers have found that exposure to media violence at least temporarily increases aggressive feelings in children, making them more likely to engage in violent or fearful behavior; the direct, short-term effects on teens and adults are less clear. It makes sense for parents to be aware of the potential influence of the media on their children. A child may not clearly understand the distinctions between the fantasy world portrayed in the media and the complexities of the real world. Parents should monitor the TV shows, movies, video games, music, and other forms of media to which children are exposed. Watching programs with children gives parents the opportunity to talk to children about violence and its consequences, to explain that violence is not the best way to resolve conflicts or solve problems, and to point out examples of positive behaviors such as kindness and cooperation.

Gender In most cases, violence is committed by men (Figure 21.2). Males are nine times more likely than females to commit murder, and four times more likely than females to be murdered. Male college students are twice as likely to be the victim of violence as female students. Some researchers have suggested that the male hormone testosterone is in some way linked to aggressive behavior. Others point to prevailing cultural attitudes about male roles (men as dominant and controlling) as an explanation for the high rate of violence among men. However, these theories do not explain why violent men are more likely to live in the South, belong to minorities, be poor, and be young.

Women do commit acts of violence, including a small but substantial proportion of murders of spouses. This fact has been used to argue that women have the same capacity to commit violence as men, but most researchers note substantial differences. Men often kill their wives as the culmination

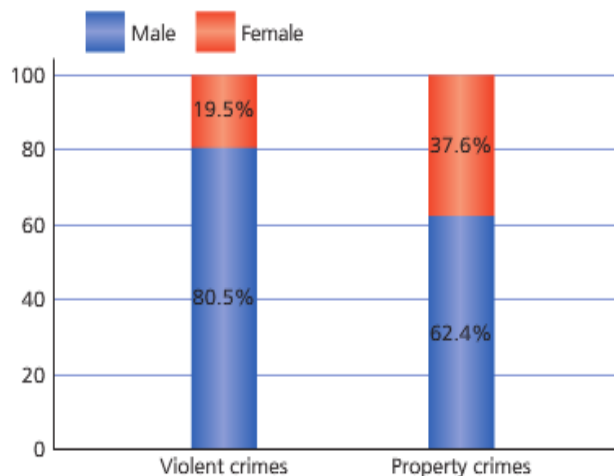


FIGURE 21.2 Arrests in the United States, 2009.

Males were arrested significantly more often than females for both violent and property crimes.

SOURCE: Federal Bureau of Investigation. 2011. *Crime in the United States 2010*. Washington, DC: U.S. Department of Justice.

of years of violence or after stalking them; they may kill their entire families and themselves at the same time. Women virtually never kill in such circumstances; rather, they kill their husbands after repeated victimization or while being beaten.

Interpersonal Factors Although most people fear attack from strangers, the majority of victims are acquainted with their attacker. More than half of murders of women and three-fourths of sexual assaults are committed by someone the woman knows. Crime victims and violent criminals tend to share many characteristics—that is, they are likely to be young, male, in a minority, and poor.

Alcohol and Other Drugs Substance abuse and dependence are consistently associated with interpersonal violence and suicide. Intoxication affects judgment and may increase aggression in some people, causing a small argument to escalate into a serious physical confrontation. On college campuses, alcohol is involved in about 95% of all violent crimes.

Firearms Many criminologists feel that the high rate of homicide in the United States is directly related to the fact that we are the only industrialized country in which handguns are widespread and easily available. Simply put, most victims of assaults with other weapons don't die, but the death rate from assault by handgun is extremely high. The use of a handgun can change a suicide attempt to a completed suicide and a violent assault to a murder.

Over 100,000 deaths and injuries occur in the United States each year as a result of the use of firearms. Firearms are used in more than two-thirds of homicides, and studies reveal a strong correlation between the incidence of gun ownership and homicide rates for a given area of the country. Over

half of all suicides involve a firearm, and people living in households in which guns are kept have a risk of suicide that is five or more times greater than that of people living in households without guns. Men between ages 15 and 34 have the highest risk of death from homicide and suicide when guns are the weapon used.

Research indicates that of all firearms, handguns are the murder weapon of choice, used in about 75% of homicides involving firearms. Teenagers and young adults are at particularly high risk for being murdered by handguns.

Assault

Assault is the use of physical force by a person or people to inflict injury or death on another; homicide, aggravated assault, and robbery are examples of assault. Research indicates that the victims of assaultive injuries and their perpetrators tend to resemble one another in terms of ethnicity, educational background, psychological profile, and reliance on weapons. In many cases, the victim actually magnifies the confrontation through the use of a weapon.

Homicide

The FBI estimates that more than 15,000 Americans were murdered in 2009. Men, teenagers, young adults, and members of minority groups, particularly African Americans and Latinos, are most likely to be murder victims. Although homicide rates for African Americans have declined dramatically in the past 25 years, the murder rate for black males is several times higher than the rate for the U.S. population as a whole. Poverty and unemployment have been identified as key factors in homicide, and this may account for the high rates of homicide among blacks and other minority groups.

Most homicides are committed with a firearm, occur during an argument, and occur among people who know one another. Intrafamilial homicide, where the perpetrator and victim are related, accounts for about one out of every eight homicides. About 40% of family homicides are committed by spouses, usually following a history of physical and emotional abuse directed at the woman. Wives are more likely to be murdered than husbands, and when a wife kills her husband, it is usually in self-defense.

Gang-Related Violence

Violence results from more than just the acts of individuals, as evidenced by the number of injuries and deaths resulting from gang activities. Gangs are most frequently associated with large cities, but gang activity also extends to the suburbs and even to rural areas. It is estimated that more than 1 million Americans belong to gangs; the average age for joining a gang is 14. Most gangs control a particular territory and will oppose other gangs, as well as police

QUICK STATS

In 2009, 21% of aggravated assaults involved the use of a firearm.

—FBI, 2010



The victims of most types of violence are statistically likely to be young (under age 25), poor, in a minority, urban, and—except for rape and domestic violence—male.

and community efforts to eliminate them. Gangs may be involved in illegal drug trade, extortion, and protection schemes. Gang members are more likely than non-gang members to possess weapons, and violence may result from conflicts over territory or illegal activities.

Gangs are more common in areas that are poor and suffer from high unemployment, population density, and crime. In these areas, a young person may feel that his or her hope of legitimate success in life is out of reach and knows that involvement in the drug market makes some gang members rich. Often gangs serve as a mechanism for companionship, self-esteem, support, and security. Indeed, in some areas gang membership may be viewed as the only possible means of survival.

Hate Crimes

When bias against another person's race or ethnicity, national origin, religion, sexual orientation, or disability motivates a criminal act, the offense is classified as a hate crime. Hate crimes may be committed against people or property. Those against people may include intimidation, assault, and even

rape or murder. Crimes against property most frequently involve graffiti, the desecration of churches or synagogues, cross burnings, and other acts of vandalism or property damage.

Nearly 8,200 hate crimes were reported in 2009; many more go unreported. Crimes against people made up about 60% of all incidents; intimidation and assault are the most common offenses. Racial or ethnic bias was cited as a motivation in 54% of the hate crimes reported in 2009. National origin or ethnicity was cited in 11% of cases, religion in 18%, and sexual orientation in 16%.

Hate crimes may be extremely brutal acts perpetrated at random on total strangers by multiple offenders. Suspects frequently are not identified, but research indicates that a substantial number of hate crimes are committed by males under age 20. Hate crimes are frequently, but not always, associated with fringe groups that have extremist ideologies, such as the Ku Klux Klan and neo-Nazi groups. The Southern Poverty Law Center tracks hundreds of hate groups and group chapters currently active in the United States; the rapid growth of hate sites on the Internet is another area of concern.

A variety of factors lead to the prejudice and intolerance that are a major force behind hate crimes. The FBI has reported a substantial increase in hate-motivated crimes in the past several years, especially since the terrorist attacks of September 11, 2001. Hate crimes against lesbian, gay, bisexual, and transgender (LGBT) people have more than tripled in recent years. A social context of unemployment and hard economic times, an influx of immigrants, and the growth of visible minority rights movements have been associated with the recent increases in hate crimes in the United States.

School Violence

According to the National School Safety Center, about 300 school-associated violent deaths of students, faculty, and administrators occurred in the last decade. Most of these deaths occurred in urban areas, at high schools, and involved use of a firearm. As with other types of violence, both victims and offenders were predominantly young men. Homicide and suicide are the most serious but least common types of violence in schools; an estimated 400,000 less serious incidents of violence and crime occur each year, including theft, vandalism, and fights not involving weapons.

How risky is the school environment for students? Children are actually much safer at school than away from it. Fewer than 1% of all homicides among youths aged 5–19 occur at school, and 90% of schools report no incidents of serious violence. Children and adolescents are far more likely to be killed by an adult in their own homes or away from school than they are to die as a result of school-associated violence. According to the National Institute of Justice (NIJ), the overall number of violent incidents has decreased steadily over the past two decades; however, the number of multiple-victim events may have increased.

Although schools are basically safe places overall, there are steps that can be taken to identify at-risk youths and improve

safety for all students. Characteristics associated with youths who have caused school-associated violent deaths include the following:

- Uncontrollable angry outbursts
- Violent and abusive language and behavior
- Isolation from peers
- Depression and irritability
- Access to and preoccupation with weapons
- Lack of support and supervision from adults

Being a victim of teasing, bullying, or social exclusion (rejection) may lead to aggressive behavior and violence.

Recommendations for reducing school violence include offering classroom training in anger management, social skills, and improved self-control; providing mental health and social services for students in need; developing after-school programs that help students build self-esteem and make friends; and keeping guns out of the hands of children and out of schools.

Workplace Violence

Each year U.S. workers experience an average of 1.5 million minor assaults, 400,000 serious assaults, 85,000 robberies, 50,000 sexual assaults, and 700 homicides. In about 60% of cases, workplace violence is committed by strangers; acquaintances account for nearly 40% of cases, and intimates for 1%. Most of the perpetrators of workplace violence are white males over age 21. Firearms are used in nearly 80% of workplace homicides, and the majority of these homicides occur during the commission of a robbery or other crime.

Police and corrections officers have the most dangerous jobs, followed by taxi drivers, security guards, bartenders, mental health professionals, and workers at gas stations and convenience and liquor stores. According to the U.S. Department of Labor, workers in state government offices experience more workplace violence of all types than do workers in local government or private industry.

General crime prevention strategies, including use of surveillance cameras and silent alarms and limiting the amount of cash on hand, can help reduce workplace violence related to robberies. A highly stressed workplace is a risk factor in cases of violence between acquaintances or coworkers; clear guidelines about acceptable behavior and prompt action after any threats or incidents of violence can help control this type of workplace violence.

Terrorism

In 2001 more Americans died as a result of terrorism than in any year before or since; the attacks on September 11 killed more than 3000 people, including citizens of 78 countries. The FBI defines *terrorism* as the unlawful use of force or

violence against people or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives. Terrorism can be either domestic, carried out by groups based in the United States, or international. It comes in many forms, including biological (see Chapter 17), chemical, nuclear, and cyber. Its intent is to promote helplessness by instilling fear of harm or destruction.

Terrorism prevention activities occur at all levels of government. U.S. government efforts include close work with the diplomatic, law enforcement, intelligence, economic, and military communities. The mission of the Department of Homeland Security is to help prevent, protect against, and respond to acts of terrorism on U.S. territory. It coordinates efforts to protect electric and water supply systems, transportation, gas and oil, emergency services, the computer infrastructure, and other systems.

Individuals have a role in preventing terrorism by making sure they are prepared in case of a terrorist attack or a disaster. They can also be proactive by reporting anything they see or hear that is suspicious or threatening. The best approach is taking personal responsibility and not letting the fear of terrorism immobilize or impede your ability to act. See Chapters 2, 3, and 23 for advice on coping with the stress of terrorism, violence on campus, and recognizing posttraumatic stress disorder.

Being a victim of teasing, bullying, or rejection may lead to aggressive behavior or violence.

Family and Intimate Violence

Violence in families challenges some of our most basic assumptions about the family. Family violence generally refers to any rough and illegitimate use of physical force, aggression, or verbal abuse by one family member toward another. Such abuse may be physical and/or psychological in nature. Based on reported cases, an estimated 6–8 million women and children are abused each year in the United States.

Battering Studies reveal that over 85% of domestic violence victims are women; 20–35% of women who visit medical emergency rooms are there for injuries related to ongoing abuse. Violence against wives or intimate partners, or battering, occurs at every level of society but is more common at lower socioeconomic levels. It occurs more frequently in relationships with a high degree of conflict—an apparent inability to resolve arguments through negotiation and compromise. Over 25% of women report having been physically assaulted or raped by an intimate partner, and more than 50% report having experienced some type of abuse—physical or psychological—in a relationship. In more than 10% of cases, the domestic violence continues for 20 years or longer. The problem of intimate violence is even apparent among young people; each year, 1.7 million high school students are victims of physical violence while on a date, according to the CDC.

At the root of much of this abusive behavior is the need to control another person. Abusive partners are controlling

TAKE CHARGE

Recognizing the Potential for Abusiveness in a Partner



There are no sure ways to tell whether someone will become abusive or violent toward an intimate partner, but there are warning signs that you can look for. (Remember that, although most abusive relationships involve male violence directed at a woman, women can also be abusive, as can partners in a same-sex relationship. Because most abusers are male, the following material refers to the abuser as “he.”) If you are concerned that a person you are involved with has the potential for violence, observe his or her behavior, and ask yourself these questions:

- What is this person’s attitude toward women? How does he treat his mother and his sister? How does he work with female students, female colleagues, or a female boss? How does he treat your women friends?
- What is his attitude toward your autonomy? Does he respect the work you do and the way you do it? Or does he mock it, tell you how to do it better, or encourage you to give it up? Does he tell you he’ll take care of you?
- How self-centered is he? Does he want to spend leisure time on your interests or his? Does he listen to you? Does he remember what you say?
- Is he possessive or jealous? Does he want to spend every minute with you? Does he cross-examine you about things you do when you’re not with him?
- What happens when things don’t go the way he wants them to? Does he blow up? Does he always have to get his way?
- Is he moody, mocking, critical, or bossy? Do you feel as if you’re walking on eggshells when you’re with him?
- Do you feel you have to avoid arguing with him?
- Does he drink too much or use drugs?
- Does he refuse to use condoms or take other precautions for safer sex?

Listen to your own uneasiness, and stay away from any man who disrespects women, who wants or needs you intensely and exclusively, and who has a knack for getting his own way almost all the time.

If you are in a serious relationship with a controlling person, you may already have experienced abuse. Consider the following questions:

- Does your partner constantly criticize you, blame you for things that are not your fault, or verbally degrade you?
- Does he humiliate you in front of others?
- Is he suspicious or jealous? Does he accuse you of being unfaithful or monitor your mail or phone calls?
- Does he track all your time? Does he discourage you from seeing friends and family?
- Does he prevent you from getting or keeping a job or attending school? Does he control your shared resources or restrict your access to money?
- Has he ever pushed, pulled, slapped, hit, kicked, bitten, or restrained you? Thrown an object at you? Used a weapon on you or pointed one at you?
- Has he ever destroyed or damaged your personal property or sentimental items, or threatened to do so?
- Has he ever forced you to have sex or to do something sexually you didn’t want to do?
- Does he anger easily when drinking or taking drugs?
- Has he ever threatened to harm you or your children, friends, pets, or property?
- Has he ever threatened to blackmail you if you leave?

If you answered yes to one or more of these questions, you may be experiencing domestic abuse. If you believe you or your children are in imminent danger, look in your local telephone directory for a women’s shelter, or call 911. If you want information, referrals to a program in your area, or assistance, contact one of the organizations listed in “For More Information” at the end of the chapter.

partners. They not only want to have power over another person, but also believe they are entitled to it, no matter what the cost to the other person. Abuse includes behavior that physically harms, arouses fear, prevents a person from doing what she wants, or compels her to behave in ways she does not freely choose. Controlling people use a variety of psychological, emotional, and physical tactics to keep their partners bound to them. Early in a relationship, a person’s tendency to be controlling may not be obvious (see the box “Recognizing the Potential for Abusiveness in a Partner”).

In abusive relationships, the abuser (in most cases a man) usually has a history of violent behavior, traditional beliefs

about gender roles, and problems with alcohol abuse. He has low self-esteem and seeks to raise it by dominating and imposing his will on another person. Research has revealed a three-phase cycle of battering, consisting of a period of increasing tension, a violent explosion and loss of control, and a period of contriteness in which the man begs forgiveness and promises it will never happen again. The batterer is drawn back to this cycle over and over again, but he never succeeds in changing his feelings about himself.

Battered women often stay in violent relationships for years. They may be economically dependent on their partners, feel trapped or fear retaliation if they leave, believe their children

need a father, or have low self-esteem themselves. They may love or pity their husband, or they may believe they'll eventually be able to stop the violence. They usually leave the relationship only when they become determined that the violence must end. Battered women's shelters offer physical protection, counseling, support, and other assistance.

Many batterers are arrested, prosecuted, and imprisoned. Treatment programs are helpful in some cases but not all. Programs focus on stress management, communication and conflict resolution skills, behavior change, and individual and group therapy. A crucial factor in changing violent behavior seems to be a partner's adamant insistence that the abuse stop.

Stalking and Cyberstalking Stalking is a crime under laws of all 50 states, the District of Columbia, the U.S. territories, and the federal government. Battering is closely associated with **stalking**, characterized by harassing behaviors such as following or spying on a person and making verbal, written, or implied threats. In the United States it is estimated that 2.5 million women and 900,000 men are stalked each year; about two-thirds of stalkers are men. About one-third of female victims are stalked by current or former intimate partners; of these, 80% had been physically or sexually assaulted by that partner during the relationship. Data indicate that the 18–24 age group experiences the highest rate of stalking, and research indicates that stalking of female college students may be greater than that experienced by the general population. A stalker's goal may be to control or scare the victim or to keep her or him in a relationship. Most stalking episodes last a year or less.

The use of the Internet, e-mail, chat rooms, Facebook, and other electronic means to stalk another person is known as **cyberstalking**. As with offline stalking, the majority of cyberstalkers are men, and the majority of victims are women, although there have been same-sex cyberstalking incidents. The U.S. Department of Justice estimates that about 900,000 people each year experience cyberstalking in which some kind of technology was used, like GPS or another form of electronic monitoring to track the victims. As the seriousness of the crime is being recognized, several states have passed cyberstalking or related laws, and a federal law is under consideration. The impersonal nature of electronic communication may lower the barriers to harassment and threats, making cyberstalking more common. The popularity of social networking and online dating sites may also increase cyberstalking, especially since new technologies can allow a stalker to be located anywhere in the world.

stalking Repeatedly harassing or threatening a person through behaviors such as following a person, appearing at a person's residence or workplace, leaving written messages or objects, making harassing phone calls, or vandalizing property; frequently directed at a former intimate partner.

cyberstalking The use of e-mail, chat rooms, bulletin boards, or other electronic communication devices to stalk another person.

TERMS

Cyberstalkers may send harassing or threatening messages to the victim, or they may encourage others to harass the victim—for example, by impersonating the victim and posting inflammatory messages and personal information on bulletin boards or in chat rooms. Guidelines for staying safe online include the following:

- Avoid using your real name on the Internet. Select an age- and gender-neutral identity.
- Avoid filling out profiles for accounts with information that could be used to identify you.
- Do not share personal information in public spaces anywhere online or give it to strangers.
- Learn how to filter unwanted e-mail messages.
- Always use passwords that are unique and contain many characters—preferably an alphanumeric combination to make it more difficult for someone to hack into your account.
- If you use a social networking site, it is best to set your profile to “private” if that is an option.
- If you experience harassment online, do not respond to the harasser. Log off or go to a different site. If harassment continues, contact the harasser's Internet service provider (ISP) by identifying the domain of the stalker's account (after the “@” sign); most ISPs have an e-mail address for complaints. Often an ISP can try to stop the conduct by direct contact with the harasser or by closing his or her account. Save all communications for evidence, and contact your ISP and your local police department. Many states have laws against cyberstalking.

Violence against Children Violence is also directed against children. In 2009 there were 3.3 million reports of alleged child abuse and neglect in the United States, with the number of children involved being near 6 million. Nearly 1 million of the cases involved physical abuse, and over 4.5 million were a result of neglect.

Parents who abuse children tend to have low self-esteem, to believe in physical punishment, to have a poor marital relationship, and to have been abused themselves (although many people who were abused as children do not grow up to abuse their own children). Poverty, unemployment, and social isolation are characteristics of families in which children are abused. External stressors related to socioeconomic and environmental factors are most closely associated with neglect, whereas stressors related to interpersonal issues are more closely associated with physical abuse. Single parents, both men and women, are at especially high risk for abusing their children. Very often one child, whom the parents consider different in some way, is singled out for violent treatment.

When government agencies intervene in child abuse situations, their goals are to protect the victims and to assist and strengthen the families. Successful programs emphasize education and early intervention, such as home visits to high-risk first-time mothers. Educational efforts focus on stress



Education, counseling, and support can help the victims of family violence.

management, money management, job-finding skills, and information about child behavior and development. Parents may receive counseling and be referred to substance abuse treatment programs. Support groups like Parents Anonymous are effective for parents committed to changing their behavior.

Elder Abuse According to the National Center on Elder Abuse, each year over 2 million older adults are abused, exploited, or mistreated by someone who is supposed to be giving them care and protection; only one in six incidents is reported. Most abusers are family members who are serving as caregivers.

Elder abuse can take different forms: physical, sexual, or emotional abuse; financial exploitation; neglect; or abandonment. Neglect accounts for about 59% of reported cases. Elders who have lost some mental or physical functions and must rely on others for care are most at risk and may suffer malnutrition, dehydration, mismanaged medication, or infection due to poor hygiene. Physical abuse accounts for about 16% of reported cases, and financial exploitation for about 12%. Experts also cite a growing concern about self-neglect among the elderly population. This includes behavior that threatens one's own health or safety, and can include refusing to comply with doctors' orders or neglecting to eat a balanced diet.

Abuse often occurs when caring for a dependent adult becomes too stressful for the caregiver, especially if the elder is incontinent, has suffered mental deterioration, or is violent. Abuse may become an outlet for frustration. Many believe

that the solution to elder abuse is support in the form of greater social and financial assistance, such as adult day care centers and education and public care programs.

Sexual Violence

The use of force and coercion in sexual relationships is one of the most serious problems in human interactions. The most extreme manifestation of sexual coercion—forcing a person to submit to another's sexual desires—is rape, but sexual coercion occurs in many subtler forms, including sexual harassment.

Sexual Assault: Rape Sexual coercion that relies on the threat and use of physical force or takes advantage of circumstances that render a person incapable of giving consent (such as being drunk) constitutes **sexual assault** or **rape**. When the victim is younger than the legally defined age of consent, the act constitutes **statutory rape**, whether or not coercion is involved. Coerced sexual activity in which the victim knows or is dating the rapist is often referred to as **date rape**, or **acquaintance rape**. Most victims know their assailants, but fewer than 40% of all sexual crimes are reported.

Any woman—or man—can be a rape victim. Over 200,000 cases of rape are reported each year. It is estimated that at least 500,000 more women are raped each year, but those incidents are unreported. Research shows that 1 in 6 women and 1 in 33 men has experienced an attempted or completed rape at some point in their lives. A study of college students also found that between 1 in 4 and 1 in 5 college women experience a completed or attempted rape during their college years. Most male-on-male rapes do not occur in prison.

QUICK STATS

Only 6% of rapists ever spend a day in jail for their offenses.

—Rape, Abuse, & Incest National Network, 2010

WHO COMMITS RAPE? Men who commit rape may be any age and come from any socioeconomic group. Some rapists are exploiters in the sense that they rape on the spur of the moment and mainly want immediate gratification. Some attempt to compensate for feelings of sexual inadequacy and an inability to obtain satisfaction otherwise. Others are more hostile and sadistic and are primarily interested in hurting and humiliating a particular woman or women in general. Often the rapist is more interested in dominance, control, and power than in sexual satisfaction.

Most women are in much less danger of being raped by a stranger than of being sexually assaulted by a man they know

sexual assault or rape The use of force to have sex with someone against that person's will.

statutory rape Sexual interaction with someone under the legal age of consent.

date rape Sexual assault by someone the victim knows or is dating; also called *acquaintance rape*.

TERMS

or date. Surveys suggest that as many as 25% of women have had experiences in which the men they were dating persisted in trying to force sex despite pleading, crying, screaming, or resisting. Surveys have also found that more than 60% of all rape victims were raped by a current or former spouse, boyfriend, or date.

Most cases of date rape are never reported to the police, partly because of the subtlety of the crime. Usually no weapons are involved, and direct verbal threats may not have been made. Rather than being terrorized, the victim usually is attracted to the man at first. Victims of date rape tend to shoulder much of the responsibility for the incident, questioning their own judgment and behavior rather than blaming the aggressor.

Sometimes husbands rape their wives. Strong evidence suggests that 15% of American women who have ever married have been raped by their husbands or ex-husbands; as many as 60% of battered women may have been raped by their husbands. A charge of spousal rape can now be taken to court in all states.

FACTORS CONTRIBUTING TO DATE RAPE Although the general status of women in society has improved, it is still a commonly held cultural belief that nice women don't say yes to sex (even when they want to) and that real men don't take no for an answer.

Men and women also differ in their perception of romantic encounters and signals. In one study, researchers found that men interpreted women's actions on dates, such as smiling or talking in a low voice, as indicating an interest in having sex, whereas the women interpreted the same actions as just being friendly. Men's thinking about forceful sex also tends to be unclear. One psychologist reports that men find "forcing a woman to have sex against her will" more acceptable than "raping a woman," even though the former description is the definition of rape.

Men who rape their dates tend to have certain attributes, including hostility toward women, a belief that dominance alone is a valid motive for sex, and an acceptance of sexual violence. They may feel that force is justified in certain circumstances, such as if they are sexually involved with a woman and she refuses to have sex, if the woman is known to have had sex with other men, or if the woman shows up at a party where people are drinking and taking drugs. The man often primes himself to force himself sexually on his date by drinking, which lowers his ordinary social inhibitions. Many college men who have committed date rape tried to seduce their dates by plying them with alcohol first.

DATE-RAPE DRUGS A 2006 study showed that drugs are a factor in more than 60% of sexual assaults, and about 5% of victims are given date-rape drugs. Also called predator drugs, the drugs include flunitrazepam (Rohypnol), gamma hydroxybutyrate (GHB), and ketamine ("Special K"). Rohypnol is not legal in the United States, but ketamine and GHB can

be legally obtained because they are used for legitimate medical purposes.

These drugs have a variety of effects, including sedation; if slipped surreptitiously into a drink, they can incapacitate a person within about 20 minutes and make her or him more vulnerable to assault. Rohypnol, GHB, and other drugs also often cause anterograde amnesia, meaning victims have little memory of what happened while they were under the influence of the drug. (See Chapter 9 for more about the effects of these and other psychoactive drugs.)

The Drug-Induced Rape Prevention and Punishment Act of 1996 adds up to 20 years to the prison sentence of any rapist who uses a drug to incapacitate a victim. Supporters of the law likened dropping a drug in a victim's drink to putting a knife to her throat. The makers of Rohypnol are modifying the pills so they will be a more noticeable color and will dissolve more slowly, thereby reducing the likelihood that Rohypnol can be used as a date-rape drug; however, other drugs in powdered or liquid form can be slipped into drinks unnoticed. Strategies such as the following can help ensure that your drink is not tampered with at a bar or party:

- Check with campus or local police to find out if drug-facilitated sexual assault has occurred in your area and, if so, where.
- Drink moderately and responsibly. Avoid group drinking and drinking games.
- Be wary of opened beverages—alcoholic or nonalcoholic—offered by strangers. When at an unfamiliar bar, watch the bartender pour your drink.
- Let your date be the first to drink from the punch bowl at a bar, club, or rave.
- If an opened beverage tastes, looks, or smells strange, do not drink it. If you leave your drink unattended, such as when you dance or use the restroom, get a fresh drink when you return to your table. Also, finish your food before leaving it unattended at the table.
- If you go to a party, club, or bar, go with friends. Have a prearranged plan for checking on each other visually and verbally. If you feel giddy or light-headed, get assistance.

Both males and females can take actions that will reduce the incidence of acquaintance rape; see the box "Preventing Date Rape" for specific suggestions.

DEALING WITH A SEXUAL ASSAULT Experts disagree about whether a woman who is faced with a rapist should fight back or give in quietly to avoid being injured or to gain time in the hope of escaping. Some rapists say that if a woman had screamed or resisted loudly, they would have run; others report they would have injured or killed her. (If a rapist is carrying a weapon, most experts advise against fighting unless absolutely necessary.) A woman who is raped by a stranger is more likely to be physically injured than a woman

Most rape victims are assaulted by someone they know, not by a stranger.

TAKE CHARGE

Preventing Date Rape



Guidelines for Women

- Believe in your right to control what you do. Set limits, and communicate these limits clearly, firmly, and early. Say no when you mean no.
- Be assertive with someone who is sexually pressuring you. Men often interpret passivity as permission.
- If you are unsure of a new acquaintance, go on a group date or double date. If possible, provide your own transportation.
- Remember that some men assume sexy dress and a flirtatious manner mean a desire for sex.
- Remember that alcohol and drugs interfere with clear communication about sex.
- Use the statement that has proven most effective in stopping date rape: "This is rape, and I'm calling the police."

Guidelines for Men

- Be aware of social pressure. It's OK to not score.
- Understand that no means no. Don't continue making advances when your date resists or tells you she wants to stop. Remember that she has the right to refuse sex.
- Don't assume sexy dress and a flirtatious manner are invitations to sex, that previous permission for sex applies to the current situation, or that your date's relationships with other men constitute sexual permission for you.
- Remember that alcohol and drugs interfere with clear communication about sex.

raped by someone she knows. Each situation is unique, and a woman should respond in whatever way she thinks best. If a woman chooses not to resist, it does not mean that she has not been raped.

If you are threatened by a rapist and decide to fight back, here is what Women Organized Against Rape (WOAR) recommends:

- Trust your gut feeling. If you feel you are in danger, don't hesitate to run and scream. It is better to feel foolish than to be raped.
- Yell—and keep yelling. It will clear your head and start your adrenaline going; it may scare your attacker and also bring help. Don't forget that a rapist is also afraid of pain and afraid of getting caught.
- If an attacker grabs you from behind, use your elbows for striking his neck, his sides, or his stomach.
- Try kicking. Your legs are the strongest part of your body, and your kick is longer than his reach. Kick with your rear foot and with the toe of your shoe. Aim low to avoid losing your balance.
- His most vulnerable spot is his knee; it's low, difficult to protect, and easily knocked out of place. Don't try to kick a rapist in the crotch; he has been protecting this area all his life and will have better protective reflexes there than at his knees.
- Once you start fighting, keep it up. Your objective is to get away as soon as you can.
- Remember that ordinary rules of behavior don't apply. It's OK to vomit, act crazy, or claim to have a sexually transmitted disease.

If you are raped, tell what happened to the first friendly person you meet. Call the police, tell them you were raped, and give your location. Try to remember as many facts as you can about your attacker; write down a description as soon as possible. Don't wash or change your clothes, or you may destroy important evidence. The police will take you to a hospital for a complete exam; show the physician any injuries. Tell the police simply, but exactly, what happened. Be honest, and stick to your story.

If you decide that you don't want to report the rape to the police, be sure to see a physician as soon as possible. You need to be checked for pregnancy and STDs.

THE EFFECTS OF RAPE Rape victims suffer both physical and psychological injury. For most, physical wounds heal within a few weeks. Psychological pain may endure and be substantial. Even the most physically and mentally strong are likely to experience shock, anxiety, depression, shame, and a host of psychosomatic symptoms after being victimized. These psychological reactions following rape constitute rape trauma syndrome, which is characterized by fear, nightmares, fatigue, crying spells, and digestive upset. (Rape trauma syndrome is a form of posttraumatic stress disorder; see Chapter 3.) Self-blame is very likely; society has contributed to this tendency by perpetuating the myths that women can actually defend themselves and that no one can be raped if she doesn't want to be. Fortunately these false beliefs are dissolving in the face of evidence to the contrary.

Many organizations offer counseling and support to rape victims. Look in the telephone directory under Rape or Rape Crisis Center for a hotline number to call. Your campus may have counseling services or a support group.

Child Sexual Abuse Child sexual abuse is any sexual contact between an adult and a child who is below the legal age of consent. Adults and older adolescents are able to coerce children into sexual activity because of their authority and power over them. Threats, force, or the promise of friendship or material rewards may be used to manipulate a child. Sexual contacts are typically brief and consist of genital manipulation; genital intercourse is much less common.

Sexual abusers are usually male, heterosexual, and known to the victim. The abuser may be a relative, a friend, a neighbor, or another trusted adult acquaintance. Child abusers are often pedophiles, people who are sexually attracted to children. They may have poor interpersonal and sexual relationships with other adults and feel socially inadequate and inferior.

One highly traumatic form of sexual abuse is **incest**: sexual activity between people too closely related to legally marry. The most common forms of incest are father–daughter (which includes stepfather–stepdaughter) abuse, brother–sister abuse (usually an adolescent boy abusing a preadolescent girl), and uncle–niece abuse; mother–son sexual activity is rare. Adults who commit incest may be pedophiles, but often they are simply sexual opportunists or people with poor impulse control and emotional problems.

Most sexually abused children are between ages 8 and 12 when the abuse first occurs. More girls are sexually abused than boys. The degree of trauma for the child can be very serious, but it varies with the type of encounters, their frequency, the child's age and relationship to the abuser, and the parents' response. Father–daughter abuse may be the most traumatic form, in part because it is a violation of the basic parent–child relationship and because the abuse tends to be more frequent. Abused children may be depressed or moody, exhibit hyperactivity, play violently with others or with inanimate objects, talk nonsense, or intentionally injure themselves.

Child sexual abuse is often unreported. Surveys suggest that as many as 27% of women and 16% of men were sexually abused as children. An estimated 150,000–200,000 new cases of child sexual abuse occur each year. It can leave lasting scars; victims are more likely to suffer as adults from low self-esteem, depression, anxiety, eating disorders, self-destructive tendencies, sexual problems, and difficulties in intimate relationships.

incest Sexual activity between close relatives, such as siblings or parents and their children.

sexual harassment Unwelcome sexual advances, requests for sexual favors, and other conduct of a sexual nature that affects academic or employment decisions or evaluations; interferes with an individual's academic or work performance; or creates an intimidating, hostile, or offensive academic, work, or student living environment.

TERMS

QUICK

STATS

About **12,000** sexual harassment charges are filed with the EEOC each year.

—U.S. Equal Employment Opportunity Commission, 2010

If you were a victim of sexual abuse as a child and feel it may be interfering with your functioning today, you may want to address the problem. A variety of approaches can help, such as joining a support group of people who have had similar experiences, confiding in a partner or friend, or seeking professional help.

Sexual Harassment Unwelcome sexual advances, requests for sexual favors, and other verbal, visual, or physical conduct of a sexual nature constitute **sexual harassment** if such conduct explicitly or implicitly does any of the following:

- Affects academic or employment decisions or evaluations.
- Interferes with an individual's academic or work performance.
- Creates an intimidating, hostile, or offensive academic, work, or student living environment.

Extreme cases of sexual harassment occur when a manager, professor, or other person in authority uses his or her ability to control or influence jobs or grades to coerce people into having sex or to punish them if they refuse. A hostile environment can be created by conduct such as sexual gestures, displaying of sexually suggestive objects or pictures, derogatory comments and jokes, sexual remarks about clothing or appearance, obscene letters, and unnecessary touching or pinching. Sexual harassment can occur between people of the same or opposite sex.

Although sexual harassment is forbidden by law, many cases go unreported. In a survey of 17,000 federal employees, 42% of women and 15% of men reported having been sexually harassed. Another survey of the general population conducted in 2010 indicated that one in six employees felt that he or she had experienced sexual harassment from a manager/supervisor or coworker. About one-third of all cases actually get reported, with women more likely to report the harassment.

If you have been the victim of sexual harassment, you can take action to stop it. Be assertive with anyone who uses language or actions you find inappropriate. If possible, confront your harasser and tell him or her that the situation is unacceptable to you and you want the harassment to stop. Be clear. "Do not ever make sexual remarks to me" is an unequivocal statement. If assertive communication doesn't work, assemble a file or log documenting the harassment, noting the details of each incident and information about any witnesses who may be able to support your claims. You may discover others who have been harassed by the same person, which will strengthen your case. Then file a grievance with the harasser's supervisor or employer, such as someone in the dean's office if you are a student or someone in the human resources office if you are an employee.

WELLNESS ON CAMPUS

Staying Safe on Campus



College campuses can be the site of criminal activity and violence just as any other environment or living situation can be—and so they require the same level of caution and awareness that you would use in other situations. Two key points to remember: 80% of campus crimes are committed by a student against a fellow student, and alcohol or drug use is involved in 90% of campus felonies. Drinking or drug use can affect judgment and lower inhibitions, so be aware if you or another person is under the influence. Here are some suggestions for keeping yourself safe on campus:

- Don't travel alone after dark. Many campuses have shuttle buses that run from spots on campus such as the library and the dining hall to residence halls and other locations. Escorts are often available to walk with you at night.
- Be familiar with well-lit and frequently traveled routes around campus if you do need to walk alone.
- If you have a car, follow the usual precautions about parking in well-lit areas, keeping the doors locked while you are driving, and never picking up hitchhikers.
- Always have your keys ready as you approach your residence hall, room, and car. Don't lend your keys to others.
- Let friends and family members know your schedule of classes and activities to create a sort of buddy system.
- Be sure the doors and windows of your dorm room have sturdy locks, and use them.
- Don't prop open doors or hold doors open for nonstudents or nonresidents trying to enter your dorm. Be aware of nonresidents around your dorm. If someone says that he or she is meeting a friend inside, that person should be able to call the friend from outside the building.
- Keep valuables and anything containing personal information—credit cards, wallets, jewelry, and so on—hidden. Secure expensive computer and stereo equipment with cables so that it can't be easily stolen. Use a quality U-shaped lock whenever you leave a bicycle unattended.
- Be alert when using an ATM, and don't display large amounts of cash.

If your attempts to deal with the harassment internally are not successful, you can file an official complaint with your city or state Human Rights Commission or Fair Employment Practices Agency, or with the federal Equal Employment Opportunity Commission. You may also wish to pursue legal action under the Civil Rights Act or under local laws prohibiting employment discrimination. Often the threat of a lawsuit or other legal action is enough to stop the harasser.



- Stay alert and trust your instincts. Don't hesitate to call the police or campus security if something doesn't seem or feel right.

The Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act, named for a Lehigh University student who was murdered in her residence hall in 1986, requires colleges and universities to collect and report campus crime statistics. You can now review this information online at the Crime Statistics website of the U.S. Department of Education's Office of Postsecondary Education (ope.ed.gov/security/Search.asp).

What You Can Do about Violence

It is obvious that violence in our society is not disappearing and that it is a serious threat to our collective health and well-being. This is especially true on college campuses, which in a sense are communities in themselves but sometimes lack the authority or guidance to tackle the issue of violence directly (see the box "Staying Safe on Campus"). Schools are now providing training for conflict resolution and are educating

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you or has anyone you know ever been the victim of a violent act? If so, what were the circumstances surrounding the event? What was the outcome? How did the event affect your life? In hindsight, what steps could have been taken to avoid or prevent the incident?

people about the diverse nature of our society, thereby encouraging tolerance and understanding. New programs are being developed at the grass-roots level to deal with problems of violence directly.

As with any public health problem, one potential approach is to identify and target high-risk groups for intervention. Violence prevention programs currently focus on conflict resolution training and the development of social skills. These measures have proven effective; but for behavior change to be lasting, the focus of such programs must expand beyond individual intervention to include social and environmental factors.

Reducing gun-related injuries may require changes in the availability, possession, and lethality of the 8–12 million firearms sold legally in the United States each year with the appropriate supporting documentation. As part of the Brady gun control law, computerized instant background checks are performed for most gun sales to prevent purchases by convicted felons, people with a history of mental instability, and certain other groups. In some states, waiting periods are required in addition to the background checks. Some groups advocate a complete and universal federal ban on the sale of all handguns.

Safety experts also advocate the adoption of consumer safety standards for guns, including features such as child-proofing and indicators to show whether a gun is loaded. Technologies are now available to personalize handguns to help prevent unauthorized use. Magnetic encoding, touch memory, radio frequency, and fingerprint reading are ways to identify the owner and prevent use by others. Education about proper storage is also important. Surveys indicate that more than 34% of homes with children contain guns. Data also show that only 39% of homes with children actually keep firearms stored properly: locked, unloaded, and separate from ammunition. To be effective, any approach to firearm injury prevention must have the support of law enforcement and the community as a whole.

PROVIDING EMERGENCY CARE

No matter how hard you try to avoid them, some injuries will inevitably occur. Therefore, it is important to prepare for situations in which you may need to provide emergency care for yourself or others. If you are prepared to help, you can improve someone else's chances of surviving or avoiding permanent disability.

CPR is as easy as

C-A-B



Compressions

Push hard and fast
on the center of
the victim's chest



Airway

Tilt the victim's head
back and lift the chin
to open the airway



Breathing

Give mouth-to-mouth
rescue breaths

American Heart
Association

Learn and Live

©2010 American Heart Association 10/10053849

In 2010, significant changes were made to the CPR guidelines. Rescuers should follow the sequence Compressions–Airway–Breathing (CAB).

A course in **first aid** can help you respond appropriately when someone is injured. One important benefit of first aid training is learning what *not* to do in certain situations. For example, a person with a suspected neck or back injury should not be moved unless there are other life-threatening conditions. A trained person can assess emergency situations accurately before acting.

Emergency rescue techniques can save the lives of people who are choking, who have stopped breathing, or whose hearts have stopped beating. As described earlier, the Heimlich maneuver is used when a victim is choking. Pulmonary resuscitation (also known as rescue breathing, artificial respiration, or mouth-to-mouth resuscitation) is used when a person is not breathing. Cardiopulmonary resuscitation (CPR) is used when a pulse cannot be found. In 2010 the American Heart Association made significant changes in its CPR

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What kinds of emergency training have you had? What kinds of skills do you have that would enable you to help someone who was hurt, was trapped, or needed some other kind of assistance?

first aid Emergency care given to an ill or injured person until medical care can be obtained.

TERMS

EMBRACING WELLNESS

Dealing with Emergencies



No matter how much training you get and how much experience you have, you will never be completely prepared for an emergency because it usually happens unexpectedly. Each emergency situation has unique variables that require you to use your knowledge and skills to help someone in need.

As a person providing assistance, you are the first link in the EMERGENCY MEDICAL SERVICES (EMS) system. The basic pattern for providing emergency care is check–call–care:

- **Check the situation:** Make sure the scene is safe for both you and the injured person. Don't put yourself in danger; if you get hurt too, you will be of little help to the injured person.
- **Check the victim:** Conduct a quick head-to-toe examination. Assess the victim's signs and symptoms, such as level of responsiveness, pulse, and breathing rate. Look for bleeding and any indications of broken bones or paralysis.
- **Call for help:** Call 911 or a local emergency number. Identify yourself and give as much information as you can about the condition of the victim and what happened.
- **Care for the victim:** If the situation requires immediate action (no pulse, shock, or the like), provide first aid if you are trained to do so.

How quickly you react to an emergency is critical, but equally important is your ability to stay calm. When you arrive, take a deep breath while you assess the situation and prepare yourself to take action. If you panic, it is more difficult to perform first aid or rescue someone from a dangerous environment. Maintaining

your composure helps you to think more clearly, and it tends to lower the victim's stress level because she/he has more confidence in your abilities.

Common sense also says to never move the victim unless absolutely necessary because it usually takes more than one person to do it properly. Providing comfort, stabilizing the person, and monitoring for symptoms of shock can be just as important to her/his well-being, especially if you are unsure of the extent of injuries.

If you decide calling for an ambulance is necessary, be sure you identify yourself and provide the appropriate information. Tell the emergency care personnel where the accident happened, what happened, the condition of each victim, and any personal information you might know about the victim(s). Never make the mistake of hanging up before being instructed to do so. After that, continue to stay calm until help arrives.

All of this sounds simple enough, but it takes planning, preparedness, and practice to become a good first responder. How you handle yourself and what you do in an emergency definitely make a difference in all circumstances, but especially in life-threatening situations.

SOURCES: Health24. 2010. *First Aid: Dealing with an Emergency* (http://www.health24.com/medical/Condition_centres/777-792-2557-2568,32332.asp); TeensHealth. 2012. *911 Emergencies* (<http://kidshealth.org/teen/safety/safebasics/911.html>); WebMD. 2010. *First Aid & Emergencies* (<http://firstaid.webmd.com/tc/dealing-with-emergencies-overview>).

guidelines for lay persons. Previous guidelines were to clear the airway, check for breathing, and begin chest compressions (ABC). The new guidelines are to begin chest compressions, clear the airway, and check for breathing (CAB). Starting with compressions gets the blood circulating, which is critical to keeping the person alive until help arrives. Compressions should be delivered fast, about 100 times a minute. Courses in first aid and CPR are offered by the American Heart Association and the American Red Cross.

A new feature of some of these courses is training in the use of automated external defibrillators (AEDs), which monitor the heart's rhythm and, if appropriate, deliver an electrical shock to restart the heart. Because of the importance of early use of defibrillators in saving heart attack victims, these devices are being installed in public places, including casinos, airports, and many office buildings.

emergency medical services (EMS) system

A system designed to network community resources for providing emergency care.

TERMS

connect™

Connect to Your Choices



Have you ever thought about where you get your behaviors and habits related to your personal safety? Many factors can influence our behaviors and habits, some not as obvious as others. Does your social circle include people who are risk takers, who think they're invincible, or who drink excessively? Are there unsafe places in your community, such as swimming pools or waterways without lifeguards? Does your residence have smoke alarms or sprinklers? Does your school have an emergency warning system in case of a terrorist attack or a dangerous situation on campus?

What are the external factors that influence your choices about personal safety? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

TIPS FOR TODAY AND THE FUTURE

Protecting yourself from injuries means taking sensible safety precautions every day, and preparing yourself to deal with an emergency.

RIGHT NOW YOU CAN:

- Check your home for any object or situation that could cause an injury, such as a tripping hazard, top-heavy shelves, and so on.
- Test the batteries in your home's smoke detectors, and change them if necessary. Test the detectors to make sure they work properly.
- If you ride a bike, check your helmet to ensure that it fits properly and will protect you in a crash. If you have any doubts, throw it away and buy a new one.

IN THE FUTURE YOU CAN:

- Get trained in CPR, rescue breathing, and the use of an automated external defibrillator. If you have already had such training, take a refresher course.
- Be watchful for hazardous situations at your school and workplace. If you notice anything suspicious, report it to an appropriate person right away.
- Prepare for a poisoning emergency by putting the number of your local poison control hotline in a conspicuous place.

SUMMARY

- Injuries are caused by a dynamic interaction of human and environmental factors. Risk-taking behavior is associated with a high rate of injury.
- Key factors in motor vehicle injuries include aggressive driving, speeding, a failure to wear safety belts, alcohol and drug intoxication, fatigue, and distraction.
- Motorcycle, motor scooter, and bicycle injuries can be prevented by developing appropriate skills, driving or riding defensively, and wearing proper safety equipment, especially a helmet.
- Most fall-related injuries are a result of falls at floor level, but stairs, chairs, and ladders are also involved in a significant number of falls.
- Careless smoking and problems with cooking or heating equipment are common causes of home fires. Being prepared for fire emergencies means planning escape routes and installing smoke detectors.
- The home can contain many poisonous substances, including medications, cleaning agents, plants, and fumes from cars and appliances.
- Performing the Heimlich maneuver can prevent someone from dying from choking.

- The proper storage and handling of firearms can help prevent injuries; assume that any gun is loaded.
- Many injuries during leisure activities result from the misuse of equipment, lack of experience, use of alcohol, and a failure to wear proper safety equipment.
- Most work-related injuries involve extensive manual labor; back problems and repetitive strain injuries are most common.
- Factors contributing to violence include poverty, the absence of strong social ties, the influence of the mass media, cultural attitudes about gender roles, problems in interpersonal relationships, alcohol and drug abuse, and the availability of firearms.
- Types of violence include assault, homicide, gang-related violence, hate crimes, school violence, workplace violence, and terrorism.
- Battering and child abuse occur at every socioeconomic level. The core issue is the abuser's need to control other people.
- Most rape victims are women, and most know their attackers. Factors in date rape include different standards of appropriate sexual behavior for men and women and different perceptions of actions.
- Child sexual abuse often results in serious trauma; usually the abuser is a trusted adult.
- Sexual harassment is unwelcome sexual advances or other conduct of a sexual nature that affects academic or employment performance or evaluations or that creates an intimidating, hostile, or offensive academic, work, or student living environment.
- Strategies for reducing violence include conflict resolution training, social skills development, and education programs that foster tolerance and understanding among diverse groups.
- Steps in giving emergency care include making sure the scene is safe for you and the injured person, conducting a quick examination of the victim, calling for help, and providing emergency first aid.

FOR MORE INFORMATION

BOOKS

- American Medical Association. 2009. *American Medical Association Handbook of First Aid and Emergency Care*. New York: Random House Reference. An everyday guide to the most current first aid and emergency resuscitation techniques, with instructions for using automatic defibrillators.
- Carr, B., and E. Wondolowski. 2011. *The Prepper's Pocket Guide: 101 Easy Things You Can Do to Ready Your Home for a Disaster*. Berkeley, CA: Ulysses Press. A practical guide to help prepare for potential disasters, both personal and environmental.
- Jones, S. A. 2011. *First Aid, Survival, and CPR: Home and Field Pocket Guide*. Philadelphia: F. A. Davis Company. A portable, waterproof guide for all kinds of first aid and survival emergencies; includes a section on pet first aid.
- Lipman, I. A. 2010. *How to Be Safe: Survival Tactics to Protect Yourself, Your Home, Your Business and Your Family*. New York: Readers Digest Books. A wide-ranging guide to safety, covering topics from home security to dealing with a terrorist attack.

World Health Organization. 2010. *Preventing Intimate Partner and Sexual Violence against Women: Taking Action and Generating Evidence*. Geneva: World Health Organization. The latest volume in a series of publications addressing the varying types of violence affecting our global society.

ORGANIZATIONS, HOTLINES, AND WEBSITES

American Association of Poison Control Centers. Provides free, confidential, and expert advice related to poisoning (800-222-1222).

www.aapcc.org

American Automobile Association Foundation for Traffic Safety. Provides consumer information about all aspects of traffic safety; the website has online quizzes and extensive links.

www.aaafoundation.org/home

American Bar Association: Domestic Violence. Provides information about statistics, research, and laws relating to domestic violence.

http://www.americanbar.org/groups/domestic_violence/resources/statistics.html

Consumer Product Safety Commission. Provides information and advice about safety issues relating to consumer products.

www.cpsc.gov

CyberAngels Internet Safety Program. Provides information about online safety and help and advice for victims of cyberstalking.

www.cyberangels.org

Insurance Institute for Highway Safety. Provides information about crashes on the nation's highways, as well as reports on topics such as speeding and crashworthiness of vehicles.

www.iihs.org

National Center for Injury Prevention and Control. Provides consumer-oriented information about unintentional injuries and violence.

www.cdc.gov/injury

National Center for Victims of Crime. An advocacy group for crime victims; provides statistics, news, safety strategies, tips on finding local assistance, and links to related sites.

www.ncvc.org

National Highway Traffic Safety Administration. Supplies materials about reducing deaths, injuries, and economic losses from motor vehicle crashes.

www.nhtsa.gov

National Safety Council. Provides information and statistics about preventing unintentional injuries.

www.nsc.org

National Violence Hotlines. Provide information, referral services, and crisis intervention.

800-799-SAFE (domestic violence)

800-422-4453 (child abuse)

800-656-HOPE (sexual assault)

Occupational Safety and Health Administration. Provides information about topics related to health and safety issues in the workplace.

www.osha.gov

Prevent Child Abuse America. Provides statistics, information, and publications relating to child abuse, including parenting tips.

www.preventchildabuse.org

Rape, Abuse, and Incest National Network (RAINN). Provides guidelines for preventing and dealing with sexual assault and abuse.

www.rainn.org

Tolerance.Org. Offers suggestions for fighting hate and promoting tolerance; sponsored by the Southern Poverty Law Center.

www.tolerance.org

World Health Organization: Violence and Injury Prevention and Disability. Provides statistics and information about the consequences of intentional and unintentional injuries worldwide.

www.who.int/violence_injury_prevention

The following sites provide statistics and background information about violence and crime in the United States:

Bureau of Justice Statistics: bjs.ojp.usdoj.gov

Federal Bureau of Investigation: www.fbi.gov

National Criminal Justice Reference Service: <https://www.ncjrs.gov/>

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BEHAVIOR CHANGE STRATEGY

Adopting Safer Habits

Why do you get injured? What human and environmental factors contribute to injuries? Identifying those factors is one step toward making your lifestyle safer. Changing unsafe behaviors before they lead to injuries is an even better way of improving your chances.

For the next 7–10 days, keep track of any mishaps you are involved in or injuries you receive, recording them in a daily behavior record. Count each time you cut, burn, or injure yourself, fall down, run into someone, or have any other potentially injury-causing mishap, no matter how trivial. Also record any risk-taking behaviors, such as failing to wear your safety belt or bicycle helmet, drinking and driving, exceeding the speed limit, putting off home or bicycle repairs, and so on. For each entry (injury or incidence of unsafe behavior), record the date, the time, what you were doing, who else was there and how you were influenced by him or her, what your motivations were, and what you were thinking and feeling at the time.

At the end of the monitoring period, examine your data. For each incident, determine both the human factors and the environmental factors that contributed to the injury or unsafe behavior. Were you tired? Distracted? Did you not realize this situation was dangerous? Did you take a chance? Did you think this incident couldn't happen to you? Was visibility poor? Were you using defective equipment? Then consider each contributing factor carefully, determining why it existed and how it could have been avoided or changed. Finally, consider what preventive actions you could take to avoid such incidents or to change your behaviors in the future.

As an example, let's say that you usually don't use a safety belt when you run local errands in your car and that several factors contribute to this behavior: you don't really think you could be involved in a crash so close to home, you go on only short trips, you just never think to use it, and so on. One of the contributing factors to your unsafe behavior is inadequate

knowledge. You can change this factor by obtaining accurate information about auto crashes (and their usual proximity to a victim's home) from this chapter and from library or Internet research. Just acquiring information about auto crashes and safety belt use may lead you to examine your beliefs and attitudes about safety belts and motivate you to change your behavior.

Once you're committed, you can use behavior change techniques described in Chapter 1, such as completing a contract and asking family and friends for support, to build a new habit. Put a note or picture reminding you to buckle up in your car where you can see it clearly. Recruit a friend to run errands with you and to remind you about using your safety belt. Once your habit is established, you may influence other people—especially people who ride in your car—to use safety belts all the time. By changing this behavior, you have reduced the chances that you or your passengers will suffer a serious injury or even die in a vehicle crash.

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A photograph of two elderly women sitting on the edge of a swimming pool. The woman on the left is Black and wearing a red swimsuit with a white star pattern and pink swim goggles on her head. The woman on the right is white and wearing a blue swimsuit and blue swim goggles on her head. Both are smiling broadly at the camera. The pool water is blue with lane lines visible in the background.

22

CHAPTER

Aging: A Vital Process

LOOKING AHEAD...

After reading this chapter, you should be able to

- List strategies for healthy aging
- Identify key physical, social, and mental changes that may accompany aging and explain how people can best confront these changes
- Describe practical considerations for older adults and caregivers, including housing, finances, health care, communication, and transportation

TEST YOUR KNOWLEDGE

1. **Women do not need to take preventive measures against osteoporosis until after menopause.**
True or false?
2. **What is the leading cause of disability in the United States?**
 - a. Heart disease
 - b. Arthritis
 - c. Dementia
3. **On average, a woman will spend more time caring for an aging relative than raising children.**
True or false?
4. **Exercise is beneficial for older people because it**
 - a. Protects against osteoporosis
 - b. Maintains alertness and intelligence
 - c. Prevents falls
5. **When Social Security was initiated in 1935, the average life expectancy was**
 - a. 58
 - b. 63
 - c. 70

ANSWERS

1. **FALSE.** All people—but especially women—need to pay attention to diet and exercise in their younger years in order to build bone mass.
2. **B.** According to the Centers for Disease Control and Prevention, arthritis is the leading cause of disability in the United States.
3. **TRUE.** The average woman will spend 17 years raising children and 18 years caring for an aging relative.
4. **ALL THREE.** Even for people over 80, exercise can improve physical functioning and balance and reduce falls and injuries.
5. **B.** Life expectancy has increased by about 15 years since 1935 due to medical advances and improvements in diet and personal habits.

Aging is the process of becoming older, a process that is genetically determined but profoundly affected by one's environment. Your grandparents or great-grandparents may be examples of how these two determinants play a role in the aging process.

Aging does not begin at some specific point in life, and there is no precise age at which a person becomes "old." Rather, aging is a normal process of development that occurs throughout life. It happens to everyone, but at different rates for different people. Some people are "old" at 25, and others are still "young" at 75.

Although youth is not entirely a state of mind, your attitude toward life and your attention to your health significantly influence the satisfaction you will get from life. This is especially true when new physical, mental, and social

challenges occur in later years. If you optimize wellness during young adulthood, you can exert great control over the physical and mental aspects of aging, and you can better handle your response to events that might be out of your control.

This chapter discusses the aging process and describes some of the major effects increasing age can have on our lives.

GENERATING VITALITY AS YOU AGE

As we age, physical and mental changes occur gradually over a lifetime. Biological aging includes all the normal, progressive, irreversible changes to our bodies that begin at birth and continue until death. Psychological aging and social aging usually

involve more abrupt changes in circumstance and emotion: relocating, changing homes, losing a spouse and friends, retiring, having a lower income, and changing roles and social status. These changes represent opportunities for growth throughout life.

Not all of these changes happen to everybody, and their timing varies, partly depending on how we have prepared for our later years. Some people never have to leave their homes and appear to be in good health until they die. Others have tremendous adjustments to make—to entirely new surroundings with fewer financial resources, to new acquaintances, to the changing physical condition of their bodies and new health problems, and possibly to loneliness and loss of self-esteem.

Successful aging requires preparation. People need to establish good health habits in their teens and twenties. During their twenties and thirties, they usually develop important relationships and settle into a particular lifestyle. By their mid-forties, they generally know how much money they need to support the lifestyle they've chosen. At this point, they must assess their financial status and perhaps adjust their savings in order to continue enjoying that lifestyle after retirement. In their mid-fifties, they need to reevaluate their health insurance plans and may want to think about retirement housing. In their seventies and beyond, they need to consider ways of sharing their legacy with the next generation. Throughout life, people should cultivate interests and hobbies they enjoy, both alone and with others.

What Happens as You Age?

A significant number of older Americans describe themselves as being in poor health (Table 22.1). Many of the characteristics

associated with aging, however, are not due to aging at all. Rather, they result from the neglect and abuse of our bodies and minds. These assaults lay the foundation for later psychological problems and chronic conditions like arthritis, heart disease, diabetes, hearing loss, vision problems, and

hypertension. We sacrifice our health by smoking, ignoring our nutritional needs, overeating, abusing alcohol and drugs, bombarding our ears with excessive noise, and exposing our bodies to too much ultraviolet radiation from the sun. We also jeopardize our bodies through inactivity, encouraging our muscles and even our bones to wither and deteriorate. And we endure abuse from the toxic chemicals in our environment.

But even with the healthiest behavior and environment, aging inevitably occurs. It results from biochemical processes we don't yet fully understand. The physiological changes in organ systems are caused by a combination of gradual aging and impairment from disease. Because of redundancy in

most organ systems, the body's ability to function is not affected until damage is fairly extensive. Studies of healthy people indicate that functioning remains essentially constant until after age 70. Further research may help pinpoint the causes of aging and aid in the development of therapies to repair damage to aging organs.

Life-Enhancing Measures: Age-Proofing

You can prevent, delay, lessen, or even reverse some of the changes associated with aging through good habits. Simple things you can do daily will make a vast difference to your level of energy and vitality—your overall wellness. The following suggestions

have been mentioned throughout this text. But because they are profoundly related to health in later life, we highlight them here.

Challenge Your Mind Numerous studies show that older adults who stay mentally active have lower levels of the brain protein linked to Alzheimer's and dementia. Reading, writing, doing puzzles, learning language, and studying music are good ways to stimulate the brain. The more complex the activity, the more protective it may be.

Develop Physical Fitness Exercise significantly enhances both psychological and physical health. A review of more than 70 scientific studies cited in the 2008 *Physical Activity Guidelines Advisory Committee Report* found that physically active people have about a 30% lower risk of dying prematurely compared with inactive people. Poor fitness and

The aging process is genetically determined but profoundly affected by our environment.

QUICK STATS

One of the nation's fastest-growing groups, the 90-plus population is projected to reach 8 million by 2050, representing 2 percent of the U.S. population.

—National Institute on Aging

Table 22.1 Americans Who Rate Their Health as Fair or Poor

AGE GROUP	PERCENTAGE
18–24	9.1%
25–34	9.9%
35–44	12.0%
45–54	16.8%
55–64	22.2%
65–74	25.5%
75 and older	31.7%

SOURCE: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. 2010. *Health Related Quality of Life* (<http://www.cdc.gov/hrqol>).



Regular exercise is a key to successful, healthy aging.

low physical activity levels were found to be better predictors of premature death than smoking, diabetes, or obesity. The committee found that about 150 minutes (2.5 hours) of physical activity per week is sufficient to decrease all-cause mortality and that it is the overall volume of energy expended, regardless of what kinds of activities produce the energy expenditure, that makes a difference in risk of premature death.

The positive effects of exercise include the following:

- Lower blood pressure and healthier cholesterol levels.
- Better protection against heart attacks and an increased chance of survival should one occur.
- Sustained or increased lung capacity.
- Weight control through less accumulation of fat.
- Maintenance of strength, flexibility, and balance.
- Improved sleep.
- Longer life expectancy.
- Protection against osteoporosis and type 2 diabetes.
- Increased effectiveness of the immune system.
- Maintenance of mental agility and flexibility, response time, memory, and hand–eye coordination.

The stimulus that exercise provides also seems to protect against the loss of **fluid intelligence**, which is the ability to

find solutions to new problems. Fluid intelligence depends on rapidity of responsiveness, memory, and alertness. Individuals who exercise regularly are also less susceptible to depression and dementia.

Regular physical activity also fends off *sarcopenia*, which is age-related loss of muscle mass, strength, and function (see Chapter 13). The weaker a person becomes, the less he or she can do; this condition can rob one of self-sufficiency and lead to greater dependence on others. The muscle wasting that occurs in sarcopenia also leads to weight gain because muscle burns more calories than fat, even at rest.

Regular physical activity is essential for healthy aging, as it is throughout life. The 2008 *Physical Activity Guidelines for Americans* include recommendations for older adults that are the same as for all adults:

- All older adults should avoid inactivity. Some physical activity is better than none.
- For substantial health benefits, older adults should do at least 150 minutes a week of moderate-intensity activity, or 75 minutes a week of vigorous-intensity activity, or a combination of both. For additional and more extensive health benefits, older adults should increase their aerobic physical activity to 300 minutes a week of moderate-intensity, or 150 minutes a week of vigorous-intensity, aerobic physical activity.
- Older adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on two or more days a week because these activities provide additional health benefits.

There are also guidelines just for older adults:

- When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow.
- Older adults should do exercises that maintain or improve balance if they are at risk of falling.
- Older adults with chronic conditions should understand whether and how their conditions affect their ability to do regular physical activity safely.
- Older adults should maintain the flexibility necessary for regular physical activity and activities of daily life.

For more about the beneficial effects of exercise for older adults, see the box “Can Exercise Delay the Effects of Aging?”

Eat Wisely Good health at any age is enhanced by eating a varied diet full of nutrient-rich foods (see Chapter 12). For many adults, that means eating more fruits, vegetables, and whole grains while eating fewer foods high in saturated and

fluid intelligence The ability to develop a solution when confronted with a new problem.

TERMS

TAKE CHARGE Can Exercise Delay the Effects of Aging?



As people age, they often experience declines in functional health—the ability to perform the tasks of everyday life—and related declines in the quality of life. According to the CDC, more than 25% of Americans over age 65 report their health as only “fair” or “poor.” Similarly, according to a Medicare survey, 31% of men and 42% of women aged 65–74 reported some sort of mobility limitation in 2003 (meaning they had difficulty walking one-quarter mile).

Can physical activity and exercise combat the degenerative effects of aging in middle-aged and older adults? The evidence indicates that they can. In reviewing the research, the U.S. government’s Physical Activity Guidelines Advisory Committee concluded that physical activity can prevent or delay the onset of limitations and declines in functional health in older adults, can maintain or improve functional health in those who already have limitations, and can reduce the incidence of falls and fall-related injuries.

One mechanism by which physical activity prevents declines in functional health is through maintenance or improvement of the physiological capacities of the body, such as aerobic power,

muscular strength, and balance—in other words, through improvements in physical fitness. Declines in these physiological capacities occur with biological aging and are often compounded by disease-related disability. But evidence shows that older adults who participate in regular aerobic exercise are 30% less likely than inactive individuals to develop functional limitations (such as a limited ability to walk or climb stairs) or role limitations (such as a limited ability to be the family grocery shopper). Although studies found that both physical activity and aerobic fitness were associated with reduced risk of functional limitations, aerobic fitness was associated with a greater reduction of risk. Evidence also suggests that regular physical activity is safe and beneficial for older adults who already have functional limitations.

Numerous studies have shown that regular exercise—particularly strength training, balance training, and flexibility exercises—can improve muscular strength, muscular endurance, and stability and provide some protection against falls. Aerobic activity, especially walking, also helps reduce risk of falls, and some evidence indicates that t’ai chi exercise programs are beneficial as well. Regular exercise not only reduces the incidence of falls but also greatly enhances mobility, allowing older people to live more independently and with greater confidence. Research also shows that regular physical activity can reduce anxiety and depression in older adults. Exercise stimulates blood flow to the brain and can even increase brain mass, helping the brain to function more efficiently and improving memory. There is some evidence that exercise may stave off mental decline and the occurrence of age-related dementia.

Current physical activity recommendations for older adults from the American Heart Association and the American College of Sports Medicine include moderate- to vigorous-intensity aerobic activity, strength training, and flexibility exercises, as well as balance exercises for older adults at risk for falls. Unfortunately more than 75% of Americans aged 65 and older do not get the recommended amounts of physical activity, and many get no exercise at all beyond the activities of daily living. Older adults are the least active group of Americans. Although it is important to exercise throughout life, the evidence indicates that older adults who become more active even late in life can experience improvements in physical fitness and functional health.

SOURCES: Centers for Disease Control and Prevention. 2007. Prevalence of regular physical activity among adults—United States, 2001 and 2005. *Morbidity and Mortality Weekly Report* 56 (46): 1209–1212; Physical Activity Guidelines Advisory Committee. 2008. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: U.S. Department of Health and Human Services; Simonsick, E. M., et al. 2005. Just get out the door! Importance of walking outside the home for maintaining mobility: findings from the Women’s Health and Aging Study. *Journal of the American Geriatrics Society* 53(2): 198–203.



trans fats and added sugars. Special guidelines for older adults include the following:

- Get enough vitamin B-12 and extra vitamin D from fortified foods or supplements.
- Limit sodium intake to 1500 mg per day, and get enough potassium (4700 mg per day). Older adults tend to have higher blood pressure and to be salt-sensitive.
- Eat foods rich in dietary fiber and drink plenty of water to help prevent constipation.
- Pay special attention to food safety. Older adults are often more susceptible to foodborne illness.

Maintain a Healthy Weight Weight management is especially difficult if you have been overweight most of your life. A sensible program of expending more calories through exercise, cutting calorie intake, or a combination of both will work for most people who want to lose weight, but there is no magic formula. Obesity is not physically healthy, and it leads to premature aging (see Chapter 14).

Control Drinking and Overdependence on Medications Alcohol abuse ranks with depression as a common hidden mental health problem, affecting about 10% of older adults. (The ability to metabolize alcohol decreases with age.) The problem is often not identified because the effects of alcohol or drug dependence can mimic disease, such as Alzheimer's disease.

Signs of potential alcohol or drug dependence include unexplained falls or frequent injuries, forgetfulness, depression, and malnutrition. Older people who retire or lose a spouse are especially at risk. Problems can be avoided by not using alcohol to relieve anxiety or emotional pain and not taking medication when safer forms of treatment are available.

Don't Smoke The average pack-a-day smoker can expect to live about 13–14 fewer years than a nonsmoker. Furthermore, smokers suffer more illnesses that last longer, and they are subject to respiratory disabilities that limit their total vigor for many years before their death. Premature balding, skin wrinkling, and osteoporosis have been linked to cigarette

smoking. Smokers at age 50 often have wrinkles resembling those of a person of 60.

Schedule Physical Examinations to Detect Treatable Diseases When detected early, many diseases, including hypertension, diabetes, and many types of cancer, can be successfully controlled by medication and lifestyle changes. Regular testing for **glaucoma** after age 40 can prevent blindness from this eye disease. Recommended screenings and immunizations can protect against preventable chronic and infectious diseases (see Chapters 14–17).

Recognize and Reduce Stress Stress-induced physiological changes increase wear and tear on your body. Cut down on the stresses in your life. Don't wear yourself out through lack of sleep, substance abuse or misuse, or overwork. Take five minutes every so often throughout the day to close your eyes and focus on your breathing. Practice relaxation using the techniques described in Chapter 2. If you contract a disease, consider it your body's attempt to interrupt your life pattern; reevaluate your lifestyle, and perhaps slow down.

QUICK

STATS

One older American dies every 35 minutes from a fall.

—National Council on Aging, 2010

DEALING WITH THE CHANGES OF AGING

As we age, we experience many losses. Loss is painful—whether it's a loss of independence, mobility, health, your long-time career, or someone you love. The changes that occur with aging have repercussions that must be grappled with and resolved. Just as you can act now to prevent or limit the physical changes of aging, you can also begin preparing yourself psychologically, socially, and financially for changes that may occur later in life. If you have aging parents, grandparents, and friends, the following information may give you insight into their lives and encourage you to begin cultivating appropriate and useful behaviors now.

Planning for Social Changes

Retirement marks a major change in the second half of life. As Americans' longevity has increased, people spend a larger proportion of their lives—17 years or more—in retirement. This has implications for reestablishing important relationships, developing satisfying interests outside work, and saving for an adequate retirement income. People who have well-developed leisure pursuits adjust better to retirement than those with few interests outside work.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

How do you feel about the prospect of growing old? Would you say that you look forward to it, or are you anxious about it? What influences have shaped your feelings about aging?

glaucoma A disease in which fluid inside the eye is under abnormally high pressure; can lead to the loss of peripheral vision and blindness.

TERMS

Changing Roles and Relationships Changes in social roles are a major feature of life as we age. Children become young adults and leave home, putting an end to daily parenting. Parents experiencing this empty-nest syndrome must adapt to changes in their customary responsibilities and personal identities. And although retirement may be a desirable milestone for most people, it may also be viewed as a threat to prestige, purpose, and self-respect—the loss of a valued or customary role—and often requires some adjustment.

Retirement and the end of child rearing also bring about changes in the relationship between marriage partners. The amount of time a couple spends together will increase, and activities will change. Couples may need a period of adjustment in which they get to know each other as individuals again. Discussing what types of activities each partner enjoys can help couples set up a mutually satisfying routine of shared and independent activities.

Increased Leisure Time Although retirement confers the advantages of leisure time and freedom from deadlines, competition, and stress, many people do not know how to enjoy their free time. If you have developed diverse interests, retirement can be a joyful and fulfilling period of your life. It

Financial planning for retirement should begin early in life—as early as your twenties.

can provide opportunities for expanding your horizons by giving you the chance to try new activities, take classes, and meet new people. Volunteering in your community can enhance self-esteem and allow you to be a contributing member of society.

The Economics of Retirement Retirement is usually accompanied by a new economic situation. It may mean a severely restricted budget or possibly even financial disaster if you don't take stock of your finances and plan ahead. Financial planning for retirement should begin early in life. People in their twenties and thirties should estimate how much money they need to support their standard of living, calculate their projected income, and begin a savings program. The earlier people begin such a program, the more money they will have at retirement.

Financial planning for retirement is especially critical for women. American women are much less likely than men to be covered by pension plans, reflecting the fact that many women have lower-paying jobs or work part-time during their childbearing years. They tend to have less money vested in other types of retirement plans as well. Although the gap is narrowing, women currently outlive men by about five to six years, and they are more likely to develop chronic conditions that impair their daily activities later in life. The net result of these factors is that older women are almost twice as likely as older men to live in poverty. Women should investigate their retirement plans and take charge of their finances to be sure they will be provided for as they get older.



The retirement years can be the best part of one's life socially, with increased opportunities to meet and interact with new and different people.

Adapting to Physical Changes

As described earlier in the chapter, there are many things a person can do to avoid or minimize the effects of the physical changes associated with aging. However, some changes in physical functioning are inevitable, and successful aging involves anticipating and accommodating these changes.

Decreased energy and changes in health mean that older people have to develop priorities for how to use their energy. Rather than curtailing activities to conserve energy, they need to learn how to generate energy. This usually involves saying yes to enjoyable activities and paying close attention to the need for rest and sleep.

Adapting, rather than giving up, favorite activities may be the best strategy for dealing with physical limitations. For example, if arthritis interferes with playing an instrument, a person can continue to enjoy music by taking up a different instrument or attending concerts.

Hearing Loss The loss of hearing is a common physical change that can have a particularly strong effect on the lives of older adults. Some people lose their hearing slowly as they age—a condition known as *presbycusis*. Hearing loss affects a person's ability to interact with others and can lead to a sense of isolation and depression. Hearing loss should be assessed and

treated by a health care professional. In some cases hearing can be completely restored by dealing with the underlying cause of hearing loss. In other cases hearing aids may be prescribed; but many older adults, especially women, resist wearing hearing aids. The cost of hearing aids may be another limiting factor.

Protect your hearing by avoiding exposure to noises above 90 decibels, such as lawnmowers, motorcycles, gunshots, and loud music (see Chapter 19). Wear earplugs when you must be around loud noises, limit your time of exposure, and stay as far as possible from the sound's source.

Vision Changes Vision usually declines with age. For some individuals this can be traced to conditions such as **glaucoma** or **age-related macular degeneration (AMD)** that can be treated medically. For others, the effects of a decline in vision can be managed using strategies to make the most of remaining vision.

Glaucoma is caused by increased pressure within the eye due to built-up fluid. The optic nerve can be damaged by this increased pressure, resulting in a loss of side vision and, if untreated, blindness. Medication can relieve the pressure by decreasing the amount of fluid produced or by helping it drain more efficiently. Laser and conventional surgery are other options. Of the 4 million Americans with glaucoma, only half know that they have it;

others lose the opportunity to control it and preserve their sight. People over 60, African Americans over 40, and anyone with a family history of glaucoma are at risk.

AMD is a slow disintegration of the *macula*—the tissue at the center of the retina where fine, straight-ahead detail is distinguished. AMD affects more than 1.5 million Americans over 40 and is the leading cause of blindness in people over age 75. Losing this vision makes it difficult to read, drive, or perform other close-up activities. Risk factors for AMD are age, gender (women may be at higher risk than men), smoking, elevated cholesterol levels, and family history. Some cases of AMD can be treated with laser surgery. Both glaucoma and AMD can be detected with regular screening.

Vision can also be affected by conditions that are products of aging. By the time they reach their forties, many people have developed **presbyopia**—a gradual decline in the ability to focus on objects close to them.

This occurs because the lens of the eye no longer expands and contracts as readily. **Cataracts**, a clouding of the lens caused by lifelong oxidation damage (a by-product of normal body chemistry), may dim vision by the sixties.

Arthritis More than 46 million American adults are estimated to have some form of **arthritis**. This degenerative disease causes joint inflammation leading to chronic pain, swelling, and loss of mobility. Its symptoms include swelling, pain, redness, warmth, tenderness, changes in joint mobility, early-morning stiffness, and unexplained weight loss, fever, or weakness in combination with joint pain. Arthritis is a disease that affects people of all ages, although it affects older adults and women more often.

There are more than 100 different types of arthritis; osteoarthritis (OA) is by far the most common. (Rheumatoid arthritis, an autoimmune disorder, is described in Chapter 17.) In a person with OA, the cartilage that caps the bones in joints wears away, forming sharp spurs (Figure 22.1). It most

QUICK STATS

120,000
Americans are blind due to glaucoma, accounting for 9–12% of all blindness.

—Glaucoma Research Foundation, 2010

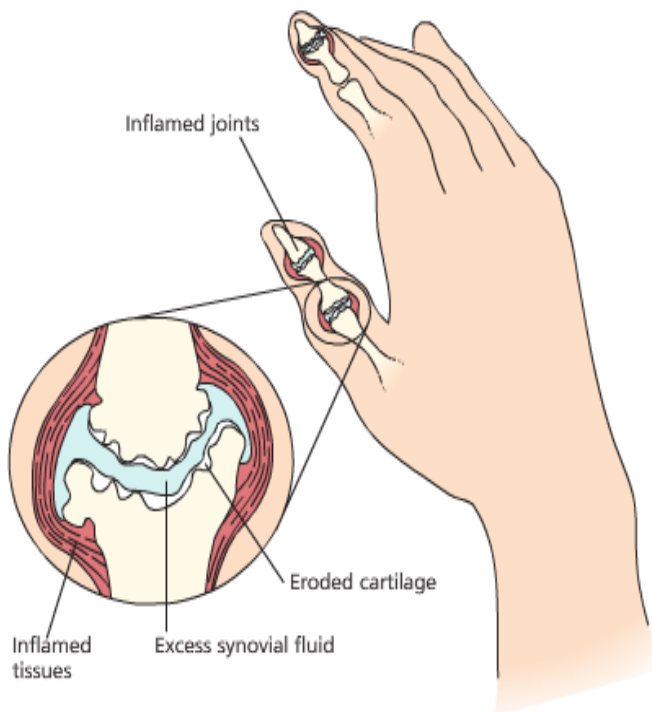


FIGURE 22.1 Osteoarthritis. When cartilage wears away within a joint, sharp spurs form and the amount of fluid increases, causing pain and swelling.

SOURCE: Clayman, C., ed. 1995. *The Human Body: An Illustrated Guide to Its Structure, Function, and Disorders*. New York: DK.

TERMS

glaucoma An increase in pressure in the eye due to fluid buildup that can result in loss of side vision and, if left untreated, blindness.

age-related macular degeneration (AMD) A deterioration of the macula (the central area of the retina) leading to blurred vision and sensitivity to glare; some cases can lead to blindness.

presbyopia The inability of the eyes to focus sharply on nearby objects, caused by a loss of elasticity of the lens that occurs with advancing age.

cataracts Opacity of the lens of the eye that impairs vision and can cause blindness.

arthritis Inflammation and swelling of a joint or joints, causing pain and swelling.

often affects the hands and weight-bearing joints of the body—the knees, ankles, and hips.

Strategies for reducing the risk of arthritis and, for those who already have OA, for managing it include exercise, weight management, and avoidance of heavy or repetitive muscle use. Weakness of the muscles around joints is linked to arthritis. This is why exercising is helpful. Exercise lubricates joints and strengthens the muscles around them, protecting them from further damage. Swimming, walking, cross-country skiing, cycling, and t'ai chi are good low-impact exercises; knitting and crocheting are excellent for the hands. Maintaining an appropriate weight is important to avoid placing stress on the hips, knees, and ankles. Assistive devices such as kitchen utensils and repair tools with large handles can also help.

It is also important to visit a physician as soon as arthritis symptoms occur so appropriate treatment can be started to reduce pain and swelling, keep joints moving safely, and prevent further joint damage. If joints are severely damaged and activity is limited, surgery to repair or replace joints may be considered, but medication is usually the first treatment. Many people with OA take medication to relieve inflammation and reduce pain. Because arthritis is a chronic condition, researchers are trying to find medications that are effective and safe when used over the long term. Nonsteroidal anti-inflammatory drugs like ibuprofen can help but can irritate the digestive tract; prescription drugs that relieve pain without damaging the stomach have been found to have other dangerous side effects. Acetaminophen can also reduce pain without upsetting the stomach, but exceeding the recommended dosage can cause liver damage.

Menopause The natural process of menopause usually occurs during a woman's forties or fifties. The ovaries gradually stop functioning, estrogen levels drop, and eventually menstruation ceases. Several years before a woman stops menstruating, her periods usually become irregular, and she may experience hot flashes, vaginal dryness, sleep disturbances, and mood swings. This period, called *perimenopause*, can be troublesome for many women, some more than others.

Lifestyle strategies to reduce menopause-related problems include many of the healthy habits discussed throughout the text: stop smoking, exercise, eat a healthful diet, lose excess weight, and perform relaxation techniques regularly. For more information about menopause, refer to Chapters 5, 15, and 16.

Sexual Functioning The ability to enjoy sex can continue well into old age, particularly if people make the effort to understand and respond to the various changes that age brings to the natural pattern of sexual response. All too often, older people give up intercourse because they mistakenly interpret these changes as signs of impending impotence. Love-making may become a more leisurely affair as a couple gets older, but the benefits of maintaining the sexual aspect of the

relationship into old age can be great. It is important for the older adult, now exploring new sexual horizons after divorce or death of a spouse, to practice safe sex. A growing number of adults over age 50 have STIs.

Osteoporosis As described in Chapter 12, **osteoporosis** is a condition in which bones become dangerously thin and fragile over time. Fractures are the most serious consequence of osteoporosis; up to 20% of all people who suffer a hip fracture die within a year. Other problems associated with osteoporosis are loss of height and a stooped posture due to vertebral fractures, severe back and hip pain, and breathing problems caused by changes in the shape of the skeleton.

Osteoporosis affects about 12 million Americans, 80% of whom are women. Women are at greater risk than men for osteoporosis because they have 10–25% less bone in their skeletons. As they lose bone mass with age, women's bones become dangerously thin sooner than men's bones (although more men will probably develop osteoporosis in the future as they live into their eighties and nineties). Bone loss accelerates in women during the first 5–10 years after the onset of menopause because of the drop in estrogen production.

(Estrogen improves calcium absorption and reduces the amount of calcium the body excretes.) Black or Latino women have higher bone density and fewer fractures than white or Asian women but may be at increased risk of osteoporosis due to lack of vitamin D (a condition caused by high levels of melatonin). Other risk factors include a family history of osteoporosis, early menopause (before age 45), abnormal or irregular menstruation, a history of anorexia, and a thin,

small frame. Regular consumption of more than two alcoholic drinks a day increases the risk of osteoporosis, possibly because alcohol can interfere with the body's ability to absorb calcium. Thyroid medication, corticosteroid drugs for arthritis or asthma, and long-term use of certain contraceptives can also have a negative effect on bone mass.

Preventing osteoporosis requires building as much bone as possible during your young years and then maintaining it as you age. Girls aged 9–18 are in their critical bone-building years, and it is recommended that they eat more foods rich in calcium and vitamin D and get adequate exercise. Weight-bearing aerobic activities must be performed regularly throughout life to have lasting effects. Strength training improves bone density, muscle mass, strength, and balance, protecting against both bone loss and falls, a major cause of fractures. Even for people in their seventies, low-intensity strength training has been shown to improve bone density.

A key to avoiding osteoporosis is to build as much bone mass as you can while you're young.

osteoporosis The loss of bone density, causing bones to become weak, porous, and more prone to fractures.

TERMS

Two other lifelong strategies for reducing the effects of osteoporosis are avoiding tobacco use and managing depression and stress. Smoking reduces the body's estrogen levels and is linked to earlier menopause and more rapid postmenopausal bone loss. Some women with depression experience significant bone loss. Researchers have not identified the reason, but it may be linked to increases in the stress hormone cortisol.

Bone mineral density testing can be used to gauge an individual's risk of fracture and help determine if any treatment is needed. It is recommended for all women over age 65 and for younger postmenopausal women who have a fracture or one or more risk factors. Below-normal bone density may be classified as *osteopenia*, which is usually treated with medication, exercise, and nutrition. A greater loss of bone mass is classified as full-blown osteoporosis and is often treated with medications.

Handling Psychological and Mental Changes

Many people associate old age with forgetfulness, and slowly losing one's memory was once considered an inevitable part of growing old. However, we now know that most older adults in good health remain mentally alert and retain their full capacity to learn and remember new information. Occasional confusion or forgetfulness may indicate only a temporary information overload, fatigue, or response to medications. Many people become smarter as they become older and more experienced in life.

Dementia Dementia is a loss of brain function that occurs with certain diseases. It affects memory, thinking, language, judgment, and behavior. About 4–5 million people in the United States have some degree of dementia, and that number will increase over the next few decades with the aging of the population. Dementia affects about 1% of people aged 60–64 years and as many as 30–50% of people older than 85 years. Early symptoms of dementia include slight disturbances in a person's ability to grasp the situation he or she is in. As dementia progresses, memory failure becomes apparent, and the person may forget conversations, the events of the day, or how to perform simple tasks. It is important to have any symptoms evaluated by a health care professional because some of the over 50 known causes of dementia are treatable (for example, depression, dehydration, malnutrition, vitamin B-12 deficiency, alcoholism, and misuse of medications).

The most common forms of dementia among older people—**Alzheimer's disease**, Lewy-Body disease, and multi-infarct dementia—are irreversible. The most common, **Alzheimer's disease (AD)**, is a progressive brain disorder that damages and eventually destroys brain cells, leading to

loss of memory, thinking, and other brain functions. Alzheimer's is not a part of normal aging, but results from a complex pattern of abnormal changes. It usually develops slowly and gradually gets worse as more brain cells wither and die. As the brain's nerve cells are destroyed, the system that produces the neurotransmitter acetylcholine breaks down, and communication among parts of the brain deteriorates. Autopsies reveal that the interiors of the affected neurons are filled with clusters of proteins known as *tangles*; the spaces between the neurons are filled with protein deposits called *amyloid plaques*. Ultimately Alzheimer's is fatal, and currently there is no cure.

About 5.3 million Americans have Alzheimer's disease, and that number is expected to quadruple in the next 50 years as more people live into their eighties and nineties. AD usually occurs in people over 60 but can occur in people as young as 40.

Early symptoms include trouble remembering new information; Alzheimer's changes typically begin in the part of the brain that affects learning. As Alzheimer's advances through the brain, it leads to increasingly severe symptoms, including disorientation; mood and behavior changes; deepening confusion about events, time, and place; unfounded suspicions about family, friends, and professional caregivers; more serious memory loss and behavior changes (hallucinations with major personality changes); and difficulty speaking, swallowing, and walking. Scientists do not yet know what causes Alzheimer's disease. Both age and genetics have been identified as risk factors, but many questions still remain.

Lewy-Body dementia is an umbrella term for a form of dementia that resembles Alzheimer's disease but has two or more distinctive features. Symptoms that differentiate Lewy-Body dementia from Alzheimer's include unpredictable levels of cognitive ability, attention, or alertness; changes in walking or movement; visual hallucinations; and a sleep disorder called REM sleep behavior disorder, in which people physically act out their dreams.

Multi-infarct dementia results from a series of small strokes or changes in the brain's blood supply that deprive the

QUICK

STATS

Alzheimer's is the sixth leading cause of death in the United States and the only cause of death among the top 10 that cannot currently be prevented, cured, or even slowed.

TERMS

dementia Deterioration of mental functioning (including memory, concentration, and judgment) resulting from a brain disorder; often accompanied by emotional disturbances and personality changes.

Alzheimer's disease A disease characterized by a progressive loss of mental functioning (dementia), caused by a degeneration of brain cells.

brain of oxygen and destroy brain tissue. Symptoms may appear suddenly and worsen with additional strokes; they include disorientation in familiar locations; walking with rapid, shuffling steps; incontinence; laughing or crying inappropriately; difficulty following instructions; and problems handling money. High blood pressure, cigarette smoking, and high cholesterol are some of the risk factors for stroke that may be controlled to prevent vascular dementia. Even for these incurable forms of dementia, treatment can improve an affected person's quality of life.

There is evidence that some cases of dementia are hereditary, but experts say genetics are not always a sure sign that a person will develop the disease. You can also take lifestyle steps to help ward off dementia, such as controlling weight and blood pressure, eating a balanced diet (including adequate B vitamins and omega-3 fatty acids), exercising, not smoking, moderating your use of alcohol, practicing stress reduction techniques, maintaining social contacts, and cultivating a variety of mental pursuits, such as doing crossword puzzles. Strong evidence links the Mediterranean diet with reduced risk of these diseases.

Grief Another psychological and emotional challenge of aging is dealing with grief and mourning. Aging is associated with loss—the loss of friends, family and spouse, peers, physical appearance, possessions, and health. Grief is the process of getting through the pain of loss, and it can be one of the loneliest and most emotionally intense times in a person's life. It can take years to completely come to terms with the loss of a loved one. (See Chapter 23 for more information about responses to loss and how to support a grieving person.)

Unresolved grief can have serious physical and psychological or emotional health consequences and may require professional help. Signs of unresolved grief include hostility toward people connected with the death (physicians or nurses, for example), talking about the death as if it occurred yesterday, and unrealistic or harmful behavior (such as giving away all of one's own belongings). Many people become depressed after the loss of a loved one or when confronted with retirement or a chronic illness. But after a period of grieving, people are generally able to resume their lives.

Depression Unresolved grief can lead to depression, a common problem in older adults (see Chapter 3). If you notice



Suicide rates are relatively high among the elderly, and depression should be taken seriously.

the signs of depression in yourself or someone you know, consult a mental health professional. A marked loss of interest in usually pleasurable activities, decreased appetite, insomnia, fatigue, and feelings of worthlessness are signs of depression. Listen carefully when an older friend or relative complains about being depressed; it may be a request for help. Suicide rates are relatively high among the elderly, and depression should be taken seriously.

Suicide Elderly Americans are more than twice as likely to commit suicide as any other demographic group. White males over age 65 have particularly high rates of suicide. Among men over age 65, the rate of suicide among whites is more than double that of any other group. Women and minorities of all ages have much lower rates of suicide than older white men.

The act of completing suicide is rarely preceded by only one cause or one reason. Factors include the recent death of a loved one; physical illness, uncontrollable pain, or the fear of a prolonged illness; perceived poor health; social isolation and loneliness; and major changes in social roles (such as retirement). Depression is probably the single most significant factor associated with suicidal behavior in older adults.

AGING AND LIFE EXPECTANCY

Life expectancy is the average length of time we can expect to live. It is calculated by averaging mortality statistics—the ages at death of a group of people over a certain period. In 2009 life

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

If scientists discovered the gene that causes Alzheimer's disease or other debilitating forms of dementia, would you want to know whether you carried this gene?

life expectancy The average length of time a person is expected to live.

TERMS



DIVERSITY MATTERS

Why Do Women Live Longer?

Women live longer than men in most countries around the world, even in places where maternal mortality rates are high. In the United States, women on average can expect to live about five years longer than men (see the table in this box). Worldwide, among people over age 100, women outnumber men about nine to one.

The reason for the gender gap in life expectancy is not entirely understood but may be influenced by biological, social, and lifestyle factors. Estrogen production and other factors during a woman's younger years may protect her from early heart disease and from age-related declines in the heart's pumping power. Women may have lower rates of stress-related illnesses because they cope more positively with stress.

The news for women is not all good, however, because not all their extra years are likely to be healthy years. They are more likely than men to suffer from chronic conditions like arthritis and osteoporosis. Women's longer life spans, combined with the facts that men tend to marry younger women and that widowed men remarry more often than widowed women, mean there are many more single older women than men. Older men are more likely to live in family settings, whereas older women are more likely to live alone. Older women are also less likely to be covered by a pension or to have



retirement savings, so they are more likely to be poor.

Increased male mortality can be traced in part to higher rates of behaviors such as smoking and alcohol and drug abuse. Testosterone production may be partly responsible in that it is linked to aggressive and risky behavior and to unhealthy cholesterol levels. Men have much higher rates of death than women from car crashes and other unintentional injuries, firearm-related deaths, homicide, suicide, AIDS, and early heart attack. Gender roles that promote risky behavior among young men are a factor in many of these

causes of death. Indeed, among people who have made it to age 65, the gender longevity gap is smaller.

Social and behavioral factors may be more important than physiological causes in explaining the gender gap; for example, among the Amish, a religious sect that has strict rules against smoking and drinking, men usually live as long as women. This suggests that the longevity gap could be substantially narrowed through lifestyle changes.

Life Expectancy

Year	Men	Women
At birth		
1900	46.3	48.3
1950	65.6	71.1
2000	74.1	79.3
2007	75.4	80.4
At age 65		
1900	11.5	12.2
1950	12.8	15.0
2000	16.0	19.0
2007	17.2	19.9

SOURCES: U.S. Census Bureau. 2005. *We the People: Women and Men in the United States*. Washington, DC: U.S. Census Bureau; National Center for Health Statistics. 2009. *Health, United States, 2009*. Hyattsville, MD: National Center for Health Statistics; World Health Organization. 2003. *Gender, Health, and Aging*. Geneva: World Health Organization.

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expectancy for the total population was 78.5 years, but those who reach age 65 can expect to live even longer—18.5 more years or longer—because they have already survived hazards to life in the younger years. Women have a longer life expectancy than men do (see the box “Why Do Women Live Longer?”). Life expectancy also varies among ethnic groups; reasons for these differences include socioeconomic, genetic, and lifestyle factors.

Life expectancy in the United States increased dramatically in the 20th century, as described in Chapter 1. This does not mean that every American lives longer now than in 1900. Rather, far fewer people die young now because childhood and infectious diseases are better controlled and diet and sanitation are much improved. Only 30% of people born in 1900 would live to age 70; of those born in 2004, closer to 77% can expect to live that long.

How long can humans expect to live in the best of circumstances? It now seems possible that our maximum potential **life span** is 100–120 years. Our **health span**, by contrast, is the period of life when we are generally healthy and free from chronic or serious disease. The major difference between life span (how long we live) and health span (how long we stay

life span A theoretically projected length of life based on the maximum potential of the human body in the best environment.

health span The period of life when one is generally healthy and free from chronic or serious disease.

TERMS

healthy) is freedom from chronic or disabling disease. Failure to achieve our life span in good health results to some degree from destructive environmental and behavioral factors—factors over which we can exert considerable control. Longevity appears to be influenced little by genetics. Studies of identical twins and other research suggest that life span is only about 3% heritable, meaning that the age at which our parents die has only a 3% effect on our own age at death.

Long life does not necessarily mean a longer period of disability, either. People often live longer because they have been well longer. A healthy old age is very often an extension of a healthy middle age. However, behavior changes cannot extend the maximum human life span, which seems to be built into our genes.

No one really knows how and why people change as they get older. Different theories claim that aging is caused by accumulated injuries from ultraviolet light, wear and tear on the body, by-products of metabolism, and so on. Other theories view aging as a predetermined, genetically programmed process.

No theory, however, sufficiently explains all the changes of the aging process. Aging is complex and varies in how it affects different people and even different organs. Most gerontologists (scientists who study aging and its effects) feel that aging is the cumulative result of the interaction of many lifelong influences, including heredity, environment, culture, diet, exercise and leisure, past illnesses, and many other factors.

LIFE IN AN AGING AMERICA

As life expectancy increases, a larger proportion of Americans will be in their later years. This change will necessitate

QUICK STATS

The life expectancy of white Americans is 78.6 years; the life expectancy of black Americans is 74.3 years; and the life expectancy of Hispanic Americans is 80.9 years.

—National Center for Health Statistics, 2010

There are many theories about aging, but none fully explains all the changes of the aging process.

new government policies and changes in our general attitudes toward older adults.

America's Aging Minority

People over age 65 are a large minority in the American population—over 40.1 million people and about 13% of the total population in 2010. That number is expected to nearly double by the year 2030 (Figure 22.2). Many older people are happy, healthy, and self-sufficient. Changes that come with age, including negative ones, normally occur so gradually that most people adapt, some even gracefully.

The enormous increase in the over-65 population is markedly affecting our stereotypes of what it means to grow old. The misfortunes associated with aging—frailty, forgetfulness, poor health, isolation—occur in fewer people in their sixties and seventies and are shifting instead to burden the very old: those over age 85.

More than 80% of older Americans own their homes. Their living expenses are lower after retirement because they no longer support children and have fewer work-related expenses; they consume and buy less food. They are more likely to continue practicing

their expertise for years after retirement: thousands of retired consultants, teachers, technicians, and craftspeople work until their middle and late seventies. They receive greater amounts of assistance, such as Medicare, pay proportionately lower taxes, and have greater net worth from lifetime savings.

Even so, according to the Administration on Aging (AOA), nearly 9% (3.4 million) of elderly people live below the poverty level; another 5.4% (2.1 million) are “near poor,” with incomes reaching 125% of the poverty level. Older women are more likely to live in poverty than older men.

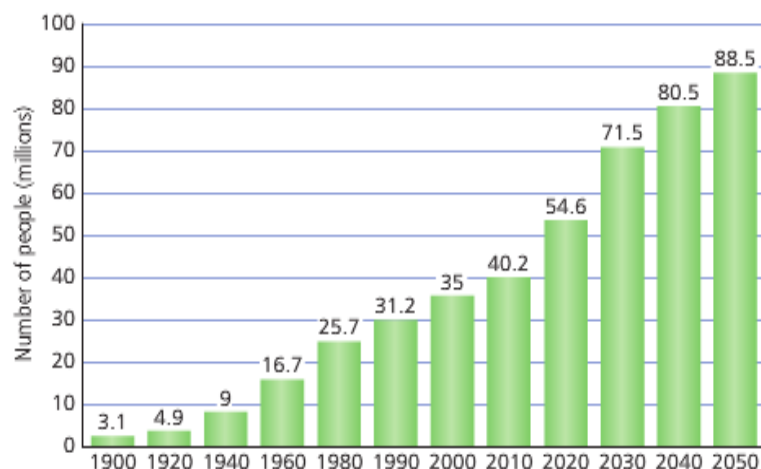


FIGURE 22.2 Increase in Americans over age 65, 1900–2050. Federal Interagency Forum on Aging-Related Statistics. 2010. *Older American 2010: Key Indicators of Well-Being*. Washington, DC: Federal Interagency Forum on Aging-Related Statistics.

People over 65 who live alone are much more likely to be poor than those who live with families.

As the aging population increases proportionately, however, the number of older people who are ill and dependent rises. Health care remains the largest expense for older adults. On average, they visit a physician 10–12 times a year, are hospitalized more frequently, and require twice as many prescription drugs as the general population. Most older Americans have at least one chronic condition; many have more than one.

Retirement finds many older people with their incomes reduced to subsistence levels. This is especially true of the very old and women. The majority of older Americans live with fixed sources of income, such as pensions, that are eroded by inflation. Expenses tend to increase more rapidly, especially those due to circumstances over which people have little or no control, such as deteriorating health. **Social Security** is the major source of income for most of the elderly. Social Security was intended to serve as a supplement to personal savings and private pensions, not as a sole source of income. It is vital to plan for an adequate retirement income.

Family and Community Resources for Older Adults

With help from friends, family members, and community services, people in their later years can remain active and independent. Over half of noninstitutionalized older Americans live with a spouse (Figure 22.3); some live with a family member other than a spouse, and 30% live alone. Only 4% live in institutional settings, but among those over age 85, about 15% live in a nursing home.

Family Involvement in Caregiving

Studies show that in about three out of four cases, a spouse, a grown daughter, or a daughter-in-law assumes a caregiving role for elderly relatives. With more parents living into their eighties and with fewer children per family, many people, especially women, will face the dilemma of how best to care for an aging relative. Surveys indicate that the average woman will spend about 17 years raising children and 18 years caring for an aging relative.

Caregiving can be rewarding, but it is also hard work. If the experience is stressful and long-term, family members may become emotionally exhausted. Corporations are increasingly responsive to the needs of their employees who are family caregivers by providing services such as referrals, flexible schedules and leaves, and on-site adult care. Professional health care advice is another critical part of successful home

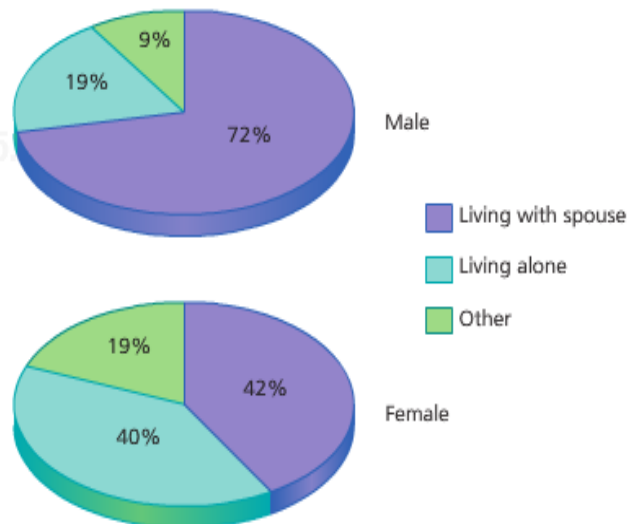


FIGURE 22.3 Living arrangements of Americans aged 65 and older, 2008.

SOURCE: Federal Interagency Forum on Aging-Related Statistics. 2010. *Older American 2010: Key Indicators of Well-Being*. Washington, DC: Federal Interagency Forum on Aging-Related Statistics.

care. Caregivers need to give special consideration to issues such as hearing and vision loss, which can make an elderly person feel disconnected or isolated, and dementia, which can make caregiving extremely challenging.

The caregiver must work with the older person's doctors and pharmacists to ensure that medication is available and taken as prescribed. (Studies show that older adults commonly skip their cholesterol and blood pressure medications, for example.) The caregiver may need to acquire a legal status called *medical power of attorney*, which enables him or her to make decisions about the patient's medical care.

The best thing a family can do is talk honestly about the obligations, time, and commitment required by caregiving. Families should also explore the community resources and professional assistance that may be available to reduce the stress in this difficult job.

Other Living and Care Options If living together is not possible for aging parents and adult children, other living and care options are available. There are agencies that recruit and match like-minded individuals for shared living situations. Homesharing offers older adults who are in fairly good health the opportunity for new relationships, either with peers or with a younger family. Intergenerational homesharing may relieve elders of transportation problems and demanding physical tasks, which can be taken care of by younger household members. Conversely, elders in good health can help busy, working families with child care and household chores.

Retirement communities are an option for individuals in good health and with a good income who want to maintain home ownership. Other types of facilities are available for

QUICK

STATS

The average American spends 20 years in retirement.

—U.S. Social Security Administration

Social Security A government program that provides financial assistance to people who are unemployed, disabled, or retired (and over a certain age); financed through taxes on business and workers.

TERMS

CRITICAL CONSUMER

Choosing a Place to Live



Later in life, many older people need help with everyday activities like shopping, cooking, walking, or bathing. Help from family and friends may be all some people need to stay active and healthy in their own homes, while others may choose to move to a place that offers more services. A variety of options are available:

- *Retirement communities* allow maximum independence with very little supervision. They may offer transportation, activities, and other services but do not routinely offer assistance with basic needs.
- *Residential care homes* are licensed to provide services to three or more residents in a smaller environment, typically in a private home. They may provide assistance with medications, bathing, dressing, transportation, daily laundry, daily housekeeping, and meals.
- *Assisted living facilities* allow independence with supervision and are licensed by the state. They provide some meals, housekeeping and laundry, transportation, and activities.



- *Nursing homes* provide 24-hour medical care and rehabilitation for residents, who are mostly very frail or suffer from the later stages of dementia.

Some providers offer all levels of care at one site. These continuing care communities allow people to move from one level to another as their needs change.

Finding the right place to live takes some investigation. Because the best homes often have a waiting list, plan ahead. Don't wait until your family member is too sick to function. Once you have an initial list of facilities in your area, start visiting the homes, keeping the following evaluation points in mind:

- Ask questions about specific facilities. Doctors, friends, relatives, local hospital discharge planners, social workers, and religious organizations can help. The ombudsperson at your state's office of long-term care can let you know if there have been problems in a particular nursing home. Residential care homes and assisted living facilities do not follow the same licensing requirements as nursing homes. Talk to people in the community to find out about these options.
- Contact the places that interest you. Ask basic questions about vacancies, number of residents, cost, and any services of interest to you, such as transportation and meals.
- Visit several places. Talk to the staff, residents, and, if possible, family members of residents. Set up an appointment, but also go unannounced and at different times of the day. Make sure residents are clean, well groomed, involved in activities, and treated with respect.
- Evaluate the facility's financial agreements. Have a lawyer look them over before you sign. Nursing homes may accept Medicare or Medicaid, but most other facilities are private-pay only. Costs can range from \$1500 per month to \$5500 per month or more.
- Moving is a big change that affects the whole family. Talk about how you feel. Once a family member has moved to a new home, visit often and pay attention to the quality of care. Say something nice when care is good, and speak up when care is poor. If you have trouble resolving a complaint, your local ombudsperson or citizen advocacy groups may be able to help.

people who need more assistance with daily living (see the box "Choosing a Place to Live").

Community Resources Community resources are available to help older adults remain active and in their own homes. Typical services include the following:

- *Senior citizens' centers or adult day care centers* provide meals, social activities, and health care services for those unable to be alone during the day.

- *Homemaker services* offer housekeeping, cooking, errand running, and escort service.
- *Visiting nurses* provide basic health care.
- *Household services* perform household repairs.
- *Friendly visitor or daily telephone reassurance services* provide contacts for older people who live alone.
- *Home food delivery services* such as "Meals on Wheels" provide meals to homebound people.

- *Adult day hospital care* provides day care plus physical therapy and treatment for chronic illnesses.
- *Low-cost legal aid* helps manage finances and health care.
- *Transportation services* offer rides at low rates.
- *Case management* helps seniors navigate confusing health care services.

Transportation Older drivers usually have safe driving records compared with young adults because they tend to be more cautious; however, crashes in the older age group are more likely to be fatal. Many states require special driver's testing for people over age 70 and may restrict some drivers as to the time, area, and distances they may drive. Because of changes in vision or other health problems, some older drivers may be required to give up their licenses before they feel ready. Elderly people report that the loss of a driver's license, and the loss of independence it brings, is one of the most severe hardships they face.

Government Aid and Policies

The federal government helps older Americans through several programs, such as food stamps, housing subsidies, Social Security, Medicare, and Medicaid. Social Security, the life insurance and old-age pension plan, has saved many from destitution, although it is intended not as a sole source of income but as a supplement to other income. Social Security funds have been used to cover other government financial deficits, so the future solvency of the program is uncertain.

Medicare is a major health insurance program for older adults and disabled persons. Medicare Part A is financed by part of the payroll (FICA) tax that also pays for Social Security. Medicare Part B is financed by monthly premiums paid by people who choose to enroll. Part A helps pay for inpatient hospital care, some inpatient care in a skilled nursing facility, and some types of home and hospice care. Medicare Part B helps pay for physicians' services and other services not covered by Part A. Medicare Part D is a prescription drug coverage plan.

Medicare pays about 28% of the medical costs of older Americans. It provides basic health care coverage for acute episodes of illness that require skilled professional care; it pays for some preventive services, including an initial physical exam, vaccinations, and screenings for CVD, certain cancers, osteoporosis, diabetes, and glaucoma. It does not pay for many office visits, dental care, and dentures. Over 1.6 million older people currently live in nursing homes, but Medicare pays less than 2% of nursing home costs, and private insurers pay less than 1%, creating a tremendous financial burden for nursing home residents and their families.

When their financial resources are exhausted, people may apply for Medicaid. A 1965 amendment to the Social Security Act, Medicaid provides medical insurance to low-income people of any age. Funded by state and federal contributions,



Some individuals defy all preconceived ideas about age and continue to live vigorous and productive lives into their seventies, eighties, and beyond.

the services vary from state to state but typically include hospital, nursing home, and home health care; physician services; and some medical supplies and services.

A crucial question regarding aid for the elderly is who will pay for it. The government picks up many of these health care expenses, primarily through Medicare and Medicaid. Total health care expenditures are 16–17% of the U.S. gross domestic product; about one-third of these expenditures go to care for older Americans.

Health care policy planners hope that rising medical costs for older adults will shrink dramatically through education and prevention. Health care professionals, including **gerontologists** and **geriatricians**, are

QUICK STATS

In 2005 Social Security benefits accounted for 38% of the aggregate income of the older population.

—AOA, 2008

TERMS

gerontologist One who studies the biological, psychological, and social phenomena associated with aging and old age.

geriatrician A physician specializing in the diseases, disabilities, and care of older adults.

beginning to practice preventive medicine, just as pediatricians do. They advise older people about how to avoid and, if necessary, how to manage disabilities.

Changing the Public's Idea of Aging

Aging people may be one of our least used and least appreciated resources. How can we use the knowledge and productivity of our growing numbers of older citizens, particularly those now leaving the work force through mandatory early retirement?

To start, we must change our thinking about what aging means. We must learn to judge productivity rather than age. Capacity to function should replace age as a criterion for usefulness. Instead of singling out 65 as a magic number, we could consider ages 50–75 as the third quarter of life. Changes occur around 50 that signal a new era: Children are usually grown and gone, and a person has often achieved a level in career, earnings, and accomplishments that meets his or her ambitions. The upper end of this quarter is determined by the fact that most people today are vigorous, in good health, mentally alert, and capable of making a productive contribution until they are at least in their seventies.

However we define old age, the costs of losing what older adults can contribute to our national productivity and quality of life are too high. Through their early retirement, we forfeit substantial income tax and Social Security tax revenues on their earnings. Those who retire at 62 start using their Social Security benefits earlier than they otherwise would, and they receive lower monthly benefit amounts.

A far better arrangement would be to make available full-time and part-time volunteer and paid employment. We would benefit by providing retraining programs for both occupational and leisure activities. Volunteer opportunities, such as preparing recordings for the blind, helping with activities for the disabled, and performing necessary tasks in hospitals, could be expanded. At the same time, we could possibly change both public and private pension programs to make partial retirement possible. In such cases we could allow people to borrow against their Social Security benefits to finance retraining or enrollment in new educational programs.

There can be benefits to aging, but they don't come automatically. They require planning and wise choices earlier in life. One octogenarian, Russell Lee, founder of a medical clinic in California, perceived the advantages of aging as growth: "The limitations imposed by time are compensated by the improved taste, sharper discretion, sounder mental

and esthetic judgment, increased sensitivity and compassion, clearer focus—which all contribute to a more certain direction in living. . . . The later years can be the best of life for which the earlier ones were preparation."

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Connect to Your Choices

Have you ever thought about where you get your attitudes toward aging and older adults? Many factors can influence our attitudes, some not as obvious as others. Were your grandparents part of your life when you were growing up? Do your parents express negative feelings about growing older and aging? Are older adults present and visible in your community, or are you surrounded primarily by young adults? How susceptible are you to ageism, and how strongly are you influenced by the youth orientation of the media?

What are the external factors that influence your attitudes toward aging? What are your inner motivations and core values, and how do they affect your choices? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

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TIPS FOR TODAY AND THE FUTURE

The best way to ensure a high-quality life in later years is by cultivating healthy habits in your younger years.

RIGHT NOW YOU CAN:

- Review your financial situation, and start thinking about a plan for the future.
- Think about any unhealthy habits you have and resolve to change them. Review the information in this text to devise strategies for change.
- If you know any older people, speak to them about what aging has meant to them, and see what lessons you can learn from them.

IN THE FUTURE YOU CAN:

- Learn a new skill, such as a language or a game of strategy.
- Volunteer with a nonprofit group in your community; consider a literacy campaign, a soup kitchen, a youth mentoring program, or a group that helps the elderly in some manner.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What do you want your life to be like when you are old? Do you hope to retire, or keep working indefinitely? Where would you like to live? How much time do you spend thinking about these questions? Have you done any planning yet for old age?

SUMMARY

- People who take charge of their health during their youth have greater control over the physical and mental aspects of aging.

- Biological aging takes place over a lifetime, but some of the other changes associated with aging are more abrupt.
- A lifetime of interests and hobbies helps maintain creativity and intelligence.
- Exercise and a healthful diet throughout life enhance physical and psychological health.
- Alcohol abuse is a common but often hidden problem, as is overdependence on medications. Tobacco use not only shortens life but also may cause severe health impairment for many years.
- Regular physical examinations help detect conditions that can shorten life and make old age less healthy.
- Stress increases wear and tear on the body; getting enough sleep, avoiding drugs, and practicing relaxation help reduce stress.
- Retirement can be a fulfilling and enjoyable time of life for those who adjust to their new roles, enjoy participating in a variety of activities, and have planned ahead for financial stability.
- Successful aging involves anticipating and accommodating physical changes and limitations.
- Slight confusion and forgetfulness are not signs of a serious illness; however, severe symptoms may indicate Alzheimer's disease or another form of dementia.
- Resolving grief and mourning and dealing with depression are important tasks for older adults.
- Older adults can be role models for the successful integration of life's experiences and the ability to adapt to challenges.
- People over age 65 form a large minority in the United States, and their status is improving. But older adults who are ill and dependent—often those who were already poor—experience major social and economic problems.
- Family and community resources can help older adults stay active and independent.
- Government aid to the elderly includes food stamps, housing subsidies, Social Security, Medicare, and Medicaid.

FOR MORE INFORMATION

BOOKS

Beers, M. H. 2005. *Merck Manual of Health and Aging: The Complete Home Guide to Healthcare and Healthy Aging for Older People and Those Who Care about Them*. New York: Ballantine. Provides information about fundamentals of aging and preventive care.

Buettner, Dan. 2010. *Thrive: Finding Happiness the Blue Zones Way*. National Geographic. Explores the world in search of those who live the longest and seeks to answer why.

Hyams, J. 2011. *Time to Help Your Parents*. London: Piatkus. A sympathetic overview of the many challenges facing adult children who must care for their aging parents.

Johns Hopkins Medical Center. 2007. *The Johns Hopkins Medical Guide to Health after 50*. New York: Black Dog & Leventhal. A practical guide to healthy aging for all wellness dimensions.

National Institute on Aging. 2010. *Exercise & Physical Activity: Your Everyday Guide from the National Institute on Aging*, book and DVD ed. New York: Hatherleigh Press. A practical guide to physical activity and exercise, with specific guidelines for safe exercise for older adults.

Weil, A. 2007. *Healthy Aging: A Lifelong Guide to Your Physical and Spiritual Well-Being*. New York: Anchor. One of America's best-known complementary care physicians discusses the aging process and explains methods for maintaining health during the latter years of life.

ORGANIZATIONS AND WEBSITES

AARP. Provides information about all aspects of aging, including health promotion, health care, and retirement planning.

<http://www.aarp.org>

Aging Well. A practical resource for seniors that includes information about diet, exercise, safety, and medical care.

<http://www.aging.ny.gov>

Alliance for Aging Research. A nonprofit organization supporting medical and psychological research on aging.

<http://www.agingresearch.org>

Alzheimer's Association. Offers tips for caregivers and patients and information on the causes and treatment of Alzheimer's disease.

<http://www.alz.org>

Arthritis Foundation. Provides information about arthritis, including free brochures, referrals to local services, and research updates.

<http://www.arthritis.org>

LeadingAge. Provides information about living and care arrangements available for older adults.

<http://www.leadingage.org/>
<http://www.arthritis.org>

Medicare. Provides information about Medicare.

<http://www.medicare.gov>

National Council on Aging. Provides helpful information about retirement planning, health promotion, and lifelong learning.

<http://www.ncoa.org>

National Institute on Aging. Provides fact sheets and brochures about aging-related topics.

<http://www.nia.nih.gov>
<http://nihseniorhealth.gov>

National Osteoporosis Foundation. Provides information about the causes, prevention, detection, and treatment of osteoporosis.

<http://www.nof.org>

U.S. Administration on Aging. Provides fact sheets, statistical information, and Internet links to other resources on aging.

<http://www.aoa.gov>

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Dying and Death

LOOKING AHEAD...

After reading this chapter, you should be able to

- Identify the physical, mental, social, behavioral, and spiritual dimensions of dying and death
- Describe various ways of defining death and the components of a mature concept of death
- Understand personal considerations in preparing for death, including making a will, assessing choices for end-of-life care, and making arrangements for a funeral or memorial service
- Describe the experience of living with a life-threatening illness and list ways to support a person who is dying
- Explain the grieving process and how support can be offered to adults and children who have experienced a loss

TEST YOUR KNOWLEDGE

1. How many adult Americans die without leaving a will?
 - a. 1 in 10
 - b. 5 in 10
 - c. 7 in 10
2. If you die in a car crash, your organs will automatically be donated to people waiting for transplants.
True or false?
3. How many Americans die each day while waiting for an organ transplant?
 - a. 3
 - b. 9
 - c. 18
4. Physician-assisted suicide is considered murder and is illegal in all 50 states.
True or false?
5. The best way to help a friend who is grieving is to distract her or him from the loss by talking about sports, gossip, or other lighthearted topics.
True or false?

ANSWERS

1. **C.** If an individual dies without leaving a will, the deceased person's estate is distributed according to state law, which may not reflect what the individual would have wanted.
2. **FALSE.** For your organs to be donated, you must have authorized it prior to your death, or the donation must be authorized by relatives at the time of your death.
3. **C.** Every day in the United States, about 77 people receive an organ transplant, but another 18 people die while waiting for a needed organ.
4. **FALSE.** Physician-assisted suicide (PAS) is legal in Oregon, Washington, and Montana.
5. **FALSE.** Many people who are grieving want to talk about their loss, and a friend who will let them talk freely is valuable. The best strategy is simply to be a good listener and follow your grieving friend's lead.

Whether it is an earthquake and tsunami killing thousands in Japan, a man collapsing with a heart attack in a crowded restaurant, or a woman in her 90s dying peacefully with her family close by, images of death are easy to envision. Nevertheless, we rarely think about the inevitability of death in our own lives. Accepting and dealing with death are important tasks that present unique challenges to our sense of self, our relationships with others, and our understanding of the meaning of life itself.

Although pain and distress may accompany the dying process, facing death also presents an opportunity for growth

as well as affirmation of the preciousness of simple aspects of our daily lives. Dealing with the death of a loved one can tear families apart, but it can also bring them together, healing old wounds in the process. The way we choose to confront death can greatly influence how we live our lives.

This chapter discusses some of the many questions surrounding the end of life. The following sections explain steps individuals can take to make their own death a bit easier for their loved ones and describe tasks you may need to consider in preparing for your own passing. This chapter also examines the process of grieving and provides advice that can help in dealing with the death of a loved one.

WHY IS THERE DEATH?

Ultimately there is no completely satisfying answer to the question of why death exists. When we look at the big picture, we see that death promotes variety through the evolution of species. The average human life is long enough to allow us to reproduce and ensure that our species continues. Yet it is brief enough to allow for new genetic combinations, thereby providing a means of adaptation to changing conditions in the environment. From the perspective of species survival, the cycle of life and death makes sense.

Senescence, the biological process of aging, is a complex process rooted in genetics and is universal in all mammals, including humans. Organisms age on both a cellular and whole-organism level, ultimately resulting in death. Although scientific understanding of senescence is progressing, and average life spans are increasing, death remains an inevitable event for humans.

From a personal point of view, death challenges our emotional and intellectual security. We may acknowledge the fact that all living things eventually die and that this is nature's way of renewal, but this recognition offers little

comfort when death touches our own lives. Questions about the meaning of death and what happens when we die are central concerns of the great religions and philosophies. Some promise a better life after death. Others teach that everyone is evolving toward perfection or divinity, a goal reached after successive rounds of death and rebirth. There are also those who suggest that it is not possible to know what—if anything—happens after death and that any judgment about life's worth must be made on the basis of satisfactions or rewards that we create for ourselves in our lifetimes.

It is worth noting that even in modern secular societies, religion plays a major role in shaping our attitudes and behaviors toward death. Religion offers solace to the extent that it suggests some meaning in dying. The mourning ceremonies associated with various religious practices ease the pangs of grief for many people. Dying and death are more than biological events; they have social and spiritual dimensions. Our beliefs—religious or philosophical—can be a key to how we relate to the prospect of our own death as well as the deaths of others.

UNDERSTANDING DEATH AND DYING

Death forces us to puzzle out an understanding of its meaning in our lives. We may choose not to think about some issues, such as the possibility of an afterlife, but we cannot keep from facing the reality of dying and death. Regardless of our explanations or efforts to minimize its effects, death can be challenging and painful—both to the person who is dying and to those left behind. However, it also offers an opportunity for growth and an appreciation of our relationships with other people and myriad other aspects of life itself.

Defining Death

Paradoxically, as our scientific understanding of death increases, defining death has become increasingly difficult. Traditionally death has been defined as cessation of the flow of vital body fluids. This occurs when the heart stops beating and breathing ceases. These traditional signs are adequate for determining death in most cases. However, over the last several decades the use of cardiopulmonary resuscitation and other medical techniques have brought many “dead” people (by the traditional definition) back to life. The use of ventilators, artificial heart pumps, and other **life support systems** allow many body functions to be artificially sustained. In such cases, making a determination of death can be difficult



Death awaits all of us at the end of our lives, and accepting and dealing with death are difficult but important tasks.

senescence The biological process of aging.

TERMS

life support systems Medical technologies, such as a ventilator, that allow vital body functions to be artificially sustained.

and often controversial. The concept of **brain death** was developed to determine whether a person is alive or dead when the traditional signs are inadequate because of supportive medical technology.

According to the standards published by a Harvard Medical School committee, brain death involves four characteristics: (1) lack of receptivity and response to external stimuli, (2) absence of spontaneous muscular movement and spontaneous breathing, (3) absence of observable reflexes, and (4) absence of brain activity, as signified by a flat **electroencephalogram (EEG)**. The Harvard criteria require that a second set of tests be performed after 24 hours have elapsed, and they exclude cases of hypothermia (body temperature below 90°F) and situations involving central nervous system depressants, such as barbiturates.

In contrast to **clinical death**, which is determined by either the cessation of heartbeat and breathing or the criteria for establishing brain death, **cellular death** refers to a gradual process that occurs when heartbeat, respiration, and brain activity have stopped. It encompasses the breakdown of metabolic processes and results in complete nonfunctionality at the cellular level. In a biological sense, therefore, death can be defined as the cessation of life due to irreversible changes in cell metabolism.

The way death is defined has potential legal and social consequences in a variety of areas, including criminal prosecution, inheritance, taxation, treatment of the corpse, and even mourning. It also affects the practice of organ transplantation because some organs—hearts, most obviously—must be harvested from a human being who is legally determined to be dead. Timing is critical in removing a heart from someone who has been declared dead and transplanting it into a person whose life can thereby be saved. Safeguards are necessary to ensure that the determination of death occurs without regard to any plans for subsequent transplantation of the deceased's organs.

Learning about Death

Our understanding of death changes as we grow and mature, as do our attitudes toward it. Very young children view death as an interruption and an absence, but their lack of a mature time perspective means that they do not understand death as final and irreversible. A child's understanding of death evolves greatly from about age 6 to age 9. During this period, most children begin to understand that death is final, universal, and inevitable. A person who consciously recognizes these facts is said to possess a **mature understanding of death**. Based on a body of work done by Mark Speece and Sandor Brent, a formal understanding of the empirical, or observable, facts about death includes four components:

1. **Universality.** All living things eventually die. Death is all-inclusive, inevitable, and unavoidable (although unpredictable with respect to its exact timing). The

bottom line is that we know we will die, but we don't know when.

2. **Irreversibility.** Organisms that die cannot be made alive again.
3. **Nonfunctionality.** Death involves the cessation of all physiological functioning, or signs of life.
4. **Causality.** There are biological reasons for the occurrence of death.

It is important to add, however, that individuals who possess a mature understanding of death commonly hold nonempirical ideas about it as well. Such nonempirical ideas—that is, ideas not subject to scientific proof—deal mainly with the notion that human beings survive in some form beyond the death of the physical body. What happens to an individual's personality after he or she dies? Does the self or soul continue to exist after the death of the physical body? If so, what is the nature of this afterlife? Developing personally satisfying answers to such questions, which involve what Speece and Brent term **noncorporeal continuity**, is also part of the process of acquiring a mature understanding of death.

In the United States, with its relative affluence and orderliness, death is not a part of the day-to-day existence of most young people. The death of a beloved pet is often a child's first experience of the reality and permanence of death. As we age, we inevitably experience the loss of loved ones. The very old have often lost nearly everyone of significance in their lives. Coping with the death of loved ones and contemplating their own impending deaths are primary tasks for the very elderly.

Denying versus Acknowledging Death

Understanding death in a mature fashion does not imply that we never experience anxiety about the deaths of those we love or about the prospect of our own death. The news of a friend's

QUICK

STATS

71% of Americans believe the soul survives after the body's death.

—Harris Interactive, 2009

TERMS

brain death A medical determination of death as the cessation of brain activity indicated by various diagnostic criteria, including a flat EEG reading.

electroencephalogram (EEG) A record of the electrical activity of the brain (brain waves).

clinical death A determination of death made according to accepted medical criteria.

cellular death The breakdown of metabolic processes at the level of the body's cells.

mature understanding of death The recognition that death is universal and irreversible, that it involves the cessation of all physiological functioning, and that there are biological reasons for its occurrence.

noncorporeal continuity The notion that human beings survive in some form after the death of the physical body.

or loved one's serious illness can shock us into an encounter with mortality that creates a need to cope not only with the painful reality of our friend's or loved one's illness, but also with our own eventual death. Our ability to find meaning and comfort in the face of mortality depends not only on our having an understanding of the facts of death, but also on our attitudes toward it.

Many people seek to avoid any thought or mention of death. The sick and old are often isolated in hospitals and nursing homes. Relatively few Americans have been present at the death of a loved one. Where the reality of death is concerned, "out of sight, out of mind" often appears to be the rule of the day. Instead of facing death directly, we tend to amuse ourselves with unrealistic portrayals in movies, television, and video games.

The fictitious deaths of characters we barely know do not cause us to confront the reality of death as it is experienced in real life. Moreover, such faked death is often presented as reversible. Children watch a daily fare of superhuman heroes, invincible to bullets and other weapons. In their games, they reenact these false ideas about death—falling down dead and jumping up again unharmed. Cartoons and video games present death in a two-dimensional world where one can die and then be reborn to play seconds later.

Our attitudes about death in our culture are also shaped by a sense that death is "creepy." Most people find dead bodies frightening, and many believe that the dead can come back to haunt us. Ghost stories and horror movies capitalize on the irrational fears that surround death. These fears can prevent us from being truly close to our loved ones as they die, and can impair our ability to say our goodbyes without being constrained by superstitious ideas about death and dead bodies.

Although some commentators characterize the predominant attitude toward death in the United States as "death denying," others are reluctant to generalize so broadly. People often maintain conflicting or ambivalent attitudes toward death. Those who come to view death as a relief or release from insufferable pain may have at least a partial sense of welcoming death. Few people wholly avoid or wholly welcome death. In the last several decades, attitudes toward death in our culture have begun to slowly change. The hospice movement (discussed in this chapter) has provided the support and guidance for many families to be present during the dying process of their loved ones, often in their own homes. Dying in a home setting fulfills the wishes of many patients and can also be a great comfort to friends and family.

Not all cultures are reluctant to publicly acknowledge death. For example, traditional Mexican culture honors the dead by remembering them often and even including them in family activities. Día de la Muerte (Day of the Dead) is an annual holiday in Mexico, in which families celebrate their departed loved ones. This is a festive holiday, tinged with some sadness, but mostly full of love, fun, and good humor. Similar celebrations that honor the dead in a festive manner are common in many cultures throughout the world. It is

interesting that in the United States Halloween is a "spooky" holiday; witches, ghosts, and scary entities of all types abound, but our own departed loved ones are not invited to the party. Although specific religions have their own ways of honoring the dead, the general American culture lacks outlets for us to remember our departed loved ones and honor their place in our hearts.

PLANNING FOR DEATH

Acknowledging the inevitability of death allows us to plan for it. Adequate planning can help ensure that a sudden, unexpected death is not made even more difficult for survivors. Even when death is not sudden, individuals with a debilitating illness may become unable to make decisions. Many decisions can be anticipated, considered, and discussed with close relatives and friends.

Basic tasks in planning for death include making a will, anticipating medical care needs and expressing preferences for end-of-life care, considering whether to become an organ donor, and helping survivors plan tasks that will be carried out after we die. It is reasonable to begin some of these plans during the college years, particularly with regard to organ donation, and to periodically review and revise our decisions throughout life. Young people can also help their older relatives by urging them to complete these important tasks.

Making a Will

Surveys indicate that about 7 out of 10 Americans die without leaving a will. Common reasons for not leaving a will include not wanting to deal with a "depressing subject," wanting to avoid the expense of legal services, and the idea that "I don't need a will because I don't have much money." Whatever the reason, dying without a will can lead to unnecessary hardships for survivors, even when an estate is modest in size.

A **will** is a legal instrument expressing a person's intentions and wishes for the disposition of his or her property

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What situations or events make you think seriously about your own mortality? Is this something you consider now and then, or do you avoid thinking about death? What has influenced your willingness or reluctance to think about death?

will A legal instrument expressing a person's intentions and wishes for the disposition of his or her property after death.

TERMS



End-of-life planning includes making a will and expressing preferences for medical care.

after death. It is a declaration of how one's **estate**—that is, money, property, and other possessions—will be distributed after death. During the life of the **testator** (the person making the will), a will can be changed, replaced, or revoked. Upon the testator's death, it becomes a legal instrument governing the distribution of the testator's estate.

When a person dies **intestate**—that is, without having left a valid will—property is distributed according to rules set up by the state. The failure to execute a will may result in a distribution of property that is not compatible with a person's wishes or best suited to the interests and needs of heirs. If you haven't yet made a will, start thinking about how you'd like your property distributed in the case of your death. If you have a will, consider whether it needs to be updated in response to a key life event such as marriage, the birth of a child, or the purchase of a home. In making a will, it is generally advisable to involve close family members to prevent problems that can arise when actions are taken without the knowledge of those who will be affected.

estate The money, property, and other possessions belonging to a person.

testator The person who makes a will.

intestate Describes a person who dies without having made a legal will.

TERMS

You can also help your family members by completing a **testamentary letter**; this document includes information about your personal affairs, such as bank accounts, credit cards, the location of documents and keys, the names of your professional advisers, the names of people who should be notified of your death, and so on.

You may feel that you are too young to be thinking about your own will, and if you are a young student, that may be reasonable. But this is a good time to be courageous and broach the subject with family members. Do your parents have a will? Do you know where they keep their important information should something happen to them? Let your family members know that their efforts to plan ahead and keep you informed are greatly appreciated.

Considering Options for End-of-Life Care

The timeline of dying has changed radically over the last several generations. Not only do we, on average, tend to live longer, but we also are much more likely to live with chronic disease and disability for months or years before we pass away, compared to past generations who tended to be relatively healthy to nearly the end of life, and die over a short period of time of an acute illness. Most of us will need some sort of care during our last days, weeks, months or even years of life.

As life draws to a close, care may involve any combination of home care, hospital stays, nursing home care, and hospice care. By becoming aware of our options, we and our families are empowered to make informed, meaningful choices.

Home Care The majority of people express a preference for at-home care during the end of life. An obvious advantage of home care is the fact that the person is in a familiar setting, ideally in the company of family and friends. Care for a person in the last stage of life is often a 24-hour-a-day job and requires varying degrees of skill, medical knowledge, and physical strength. Family members may or may not be capable of providing the level of care that is needed. Professional at-home caregivers can often make a huge difference in allowing a person to continue to live at home. This type of home care can be quite expensive, especially if it is needed on a 24-hour-per-day basis, and is usually not covered by private or governmental health insurance plans. Although private long-term care insurance is available, fewer than 1 in 10 Americans over age 50 have this type of insurance, at least in part because it is quite expensive.

When a patient requires sophisticated medical procedures or does not have access to qualified caregivers, institutional care may be more appropriate. When suitable, however, home care is generally the most satisfying option for care as a person's life comes to a close. Currently about 25% of Americans die at home, about 25% die in nursing facilities, and about 50% die in hospitals, including more than 20% in intensive care units. Terminally ill people who wish to die at home, in their assisted living residence, or in a more peaceful hospital



Hospice care focuses on relieving pain and other distressing symptoms in dying people and on providing support for family members.

environment are often aided by **hospice** programs, which are widely available throughout the United States and are providing a growing number of terminally ill patients with much-needed assistance.

Hospice Programs Hospice is a special kind of compassionate care for people in the final phase of a terminal illness. Hospice focuses on providing comfort care to patients at the end of life rather than continuing curative treatments. Most hospice patients have previously received extensive medical efforts at curing their illnesses. The decision to switch from curative efforts to hospice care usually comes when cure is no longer a likely possibility, and the downsides of aggressive medical intervention outweigh the benefits of comfort care in a homelike setting.

Hospice is a system of **palliative care** specifically for patients who are likely to die within six months or less. The goal of palliative care is to reduce pain and other discomforting symptoms, allowing patients to function and enjoy the remainder of their lives as fully as possible. Hospice care is not intended to artificially extend or shorten length of life, but rather to maximize the quality of a patient's remaining time.

About two-thirds of hospice patients stay in their own homes, but hospice care is also offered in nursing homes, hospitals, and freestanding hospice facilities. Hospice care is available without charge to people of all ages who are judged to be in their last six months of life. Typically a patient who lives at home is cared for primarily by family members, with support from hospice workers who make regular visits to the home. Hospice does not routinely provide round-the-clock physical care, but hospice services often make it possible for family, friends, and/or paid caregivers to care for patients in their own homes until death. Hospice staff members are available on call 24 hours per day, seven days a week. If there are concerns about the

patient, the family or other caregivers can call at any time of day or night. A hospice nurse will come to the patient's home to evaluate and treat the patient as needed. This generally makes it possible for the patient to avoid going to the emergency room or being admitted to the hospital. Physicians, nurses, pharmacists, clergy, social workers, home health aides, and trained volunteers make up the core members of the hospice team.

The availability of hospice care in the United States has grown at a remarkable rate since the first hospice program in the United States was established in 1974. Today there are more than 5000 such programs, serving an estimated 1.6 million terminally ill patients and their families each year. More than 40% of people who died in the United States in 2010 were under the care of a hospice program. Referrals to hospice can be made by physicians, family members, friends, clergy, other health professionals, or the patients themselves. Qualifying for hospice care usually requires that two physicians certify that a patient's life expectancy is six months or less, and both patient and physician agree to forgo treatment aimed at prolonging life. Should the patient decide that he or she wishes to resume curative treatment, hospice care can be revoked and regular Medicare coverage reinstated immediately.

The emphasis of hospice care is on enhancing the quality of life rather than extending its length. Despite this, it is common for hospice patients to live longer than expected, at least in part due to the extra care and support they receive. In addition to helping patients achieve a good and peaceful death, an important gift of hospice care is the potential to help patients and families discover how much can be shared at the end of life through personal and spiritual connections.

When hospice care first became available in the United States, most hospice patients had cancer. Today cancer accounts for only a little more than a third of hospice diagnoses. Other common hospice diagnoses include heart disease, dementia (such as Alzheimer's disease), debility, and pulmonary disease. Any patient who is likely to die within six months is eligible for hospice care, regardless of the specific diagnosis. About 65% of hospice patients are over 75 years old, although hospice programs take care of patients of all ages, including children.

Difficult Decisions at the End of Life

The decision to stop doing tests and treatments is often a difficult one for patients and their families. Many people owe their lives to the advanced medical technologies now available.

hospice A program of care for dying patients and their families.

TERMS

palliative care A form of medical care aimed at reducing the intensity or severity of a disease by controlling pain and other discomforting symptoms.

Yet a medical stance that strives to keep people alive by all means and at any cost is increasingly being questioned. In addition, medical diagnostic procedures and treatments often cause discomfort and can reduce the quality of life of people who are likely to die soon whether or not they receive further medical intervention.

Modern medicine can sometimes keep the human organism alive despite the cessation of normal heart, brain, respiratory, or kidney function. But should a patient without any hope of recovery be kept alive by means of artificial life support? At what point does such treatment become futile? What if a patient has fallen into a **persistent vegetative state**, a state of profound unconsciousness, lacking any sign of normal reflexes and unresponsive to external stimuli, with no reasonable hope of improvement?

Ethical questions about a person's right to die have become prominent since the landmark case of Karen Ann Quinlan in 1975. At age 22 she was admitted in a comatose state to an intensive care unit, where her breathing was sustained by a mechanical ventilator. When she remained unresponsive, in a persistent vegetative state, her parents asked that the respirator be disconnected, but the medical staff responsible for Karen's care denied their request. The request to withdraw treatment eventually reached the New Jersey Supreme Court, which ruled that artificial respiration could be discontinued.

Since then courts have ruled on removing other types of life-sustaining treatment, including artificial feeding mechanisms that provide nutrition and hydration to permanently comatose patients who are able to breathe on their own. Notable was the case of Terri Schiavo in 2003. Terri had been diagnosed as being in a persistent vegetative state. Contending that she would not want to continue living on life support, Terri's husband requested that her feeding tube be removed. Terri's parents contested the request, and a series of legal actions ensued. Finally, in 2005, after intervention by the U.S. Supreme Court, physicians were allowed to remove the tube. Cases like this highlight the importance of expressing one's wishes about life-sustaining treatment, in writing, before the need arises.

Withholding or Withdrawing Treatment The right of a competent patient to refuse unwanted treatment is now generally established in both law and medical practice. The consensus is that there is no medical or ethical distinction between withholding (not starting) a treatment and withdrawing (stopping) a treatment once it has been started. The choice to forgo life-sustaining treatment involves refusing treatments that would be expected to extend life. The right to refuse treatment remains constitutionally protected even when a patient is unable to communicate. Although specific requirements vary, all states authorize some type of written advance directive to honor the decisions of individuals unable

to speak for themselves but who have previously recorded their wishes in an appropriate legal document. (Advance directives are discussed later in this chapter.)

Physician-Assisted Suicide and Active Euthanasia

In contrast to withdrawing or withholding treatment, **physician-assisted suicide** and **active euthanasia** refer to practices that intentionally hasten the death of a person. Physician-assisted suicide is legal in three states in the United States, while active euthanasia is illegal throughout the United States and most of the world.

Physician-assisted suicide (PAS) occurs when a physician provides lethal drugs—at the patient's request—with the understanding that the patient plans to use them to end his or her life. The patient chooses if and when he or she wishes to take the fatal dose, usually in a home setting without the physician being present.

Oregon was the first state to legalize physician-assisted suicide following a citizens' initiative called the Death with Dignity Act, which was passed by the Oregon voters in 1994 and again in 1997. Even though PAS has been legally available in Oregon since 1994, the practice remains rare; in 2011 only 71 deaths occurred in Oregon as a result of physician-assisted suicide.

Oregon's Death with Dignity Act has many regulations and safeguards. A patient who wishes to pursue an assisted death must orally request PAS from his physician on two different occasions at least 15 days apart. The request also must be written and signed by two witnesses. Two physicians need to confirm the patient's diagnosis and prognosis, whether the person is capable of making such a decision, and whether the patient may have a psychological disorder (such as depression). If either physician suspects a psychological disorder, the patient must be referred for a psychological evaluation. The patient must be informed of alternatives to PAS such as pain control and comfort and hospice care. A patient can rescind a PAS request at any time, and experience has shown that about one-third of patients who have received lethal medication from their physician have chosen not to use it. Many patients who end up not using the medication have said that merely having the means to end their own suffering gave

QUICK STATS

114 prescriptions were written for lethal drugs under Oregon's Death with Dignity Act in 2011; 71 patients actually took the drugs.

—Oregon Department of Human Services, 2012

TERMS

persistent vegetative state A condition of profound unconsciousness in which a person lacks normal reflexes and is unresponsive to external stimuli, lasting for an extended period with no reasonable hope of improvement.

physician-assisted suicide (PAS) The practice of a physician intentionally providing, at the patient's request, lethal drugs or other means for a patient to hasten death with the understanding that the patient plans to use them to end his or her life. The patient administers the drug to himself or herself.

them great comfort, and in the end they chose to let nature take its own course.

In 1997, and again in 2006, the U.S. Supreme Court affirmed that individual states have the right to craft policy concerning physician-assisted suicide—either prohibiting it, as most states now do, or permitting it under a regulatory system. This meant that Oregon's Death with Dignity Act remained legal. Since then the states of Washington and Montana have also chosen to allow physician-assisted suicide.

Patients who choose PAS generally have strong beliefs in personal autonomy and a determination to control the end of their lives. PAS is not an option for patients with diseases that effect their mental functioning, such as dementia or psychiatric disorders. In addition, physicians can choose whether they wish to participate in the Death with Dignity Act. In Oregon, physicians employed by the Veteran's Administration and many Catholic hospitals are not allowed to participate in PAS as terms of their employment.

When the Supreme Court ruled on PAS in 1997, it also ruled on the concept of **double effect** in the medical management of pain. The doctrine of double effect states that a harmful effect of treatment, even if it results in death, is permissible if the harm is not intended and occurs as a side effect of a beneficial action. Sometimes the dosages of medication needed to relieve a patient's pain (especially those in the end stage of some diseases) must be increased to levels that can cause respiratory depression, which could hasten the patient's death. Thus the relief of suffering, the intended good effect, may have a potential bad effect, which is foreseen but is not the primary intention. The Court said that giving medication as needed to control pain, even if it hastens death, is not considered physician-assisted suicide if the intent is to relieve pain. The doctrine of double effect allows physicians throughout the United States to do what is necessary to relieve pain, even if there is a chance that the medication may hasten death.

Unlike physician-assisted suicide, **active euthanasia** is the intentional act of killing someone who would otherwise suffer from an incurable and painful disease. Active euthanasia can be involuntary, nonvoluntary, or voluntary. *Involuntary euthanasia* (or involuntary active euthanasia) refers to the ending of a patient's life by a medical practitioner without the patient's consent. The most notorious example of this is the medical killing programs of the Nazi regime. *Nonvoluntary euthanasia* occurs when a surrogate decision maker (not the patient) asks a physician for assistance to end another person's life.

Voluntary euthanasia (also known as voluntary active euthanasia, or VAE) is the intentional termination of life at the patient's request by someone other than the patient. In practice, this generally means that a competent patient requests direct assistance to die, and he or she receives assistance from a qualified medical practitioner. Voluntary active euthanasia is legal under very strict guidelines in Belgium, Luxembourg, and the Netherlands, but is currently unlawful in the United States and the rest of the world. In the United States, taking active steps to end someone's life is a crime—even if the motive is mercy. In practice, polls of U.S. physicians show that it

is not uncommon for physicians to quietly prescribe or administer medication to hasten a suffering person's death.

Many people believe that the demand by some patients for physician-assisted suicide or euthanasia results from inattention to the needs of the dying by the health care system. Advocates of hospice and palliative care have highlighted the need for adequate pain management, not only for patients with terminal illness, but for all patients with untreated or undertreated pain and suffering. Increasingly, pain is being viewed as a "fifth vital sign" that should be added to the four vital signs—temperature, pulse, respiration, and blood pressure—now recorded and assessed as a standard part of patient care.

Unfortunately there is tremendous variation among health care providers with respect to assessing and managing pain adequately. Many physicians are uncomfortable using strong pain medications because of lack of experience as well as fear of scrutiny by authorities such as the U.S. Drug Enforcement Agency. Physicians also worry about causing addiction and contributing to the illegal use of narcotics.

Even when physicians are aggressive in treating pain, there are times when adequate pain control is difficult to achieve. When a patient is near death and still suffering despite optimal treatment with pain medications, sometimes **palliative sedation** will be used. This involves giving a sedative medication that keeps the patient in an unconscious or semiconscious state until pain is brought under control or the patient dies as a result of his underlying disease. Palliative sedation is not meant to hasten death; rather it is used as a last resort when physician, patient, and family agree that this is the best way to relieve otherwise intractable suffering. Palliative sedation is legal in the United States and is accepted by the American Medical Association and many other medical organizations when used as a last resort in appropriately selected cases.

Completing an Advance Directive

To make your preferences known about medical treatment, you need to document them through a written **advance directive**. In a general sense, an advance directive is any statement

double effect A situation in which a harmful effect occurs as an unintended side effect of a beneficial action, such as when medication intended to control a patient's pain has the unintended result of causing the patient's death.

TERMS

active euthanasia A deliberate act intended to end another person's life; voluntary active euthanasia involves the practice of a physician administering—at the request of a patient—medication or some other intervention that causes death.

palliative sedation The practice of using a sedative medication to keep a patient in an unconscious or semiconscious state until pain is brought under control or the patient dies as a result of the underlying disease.

advance directive Any statement made by a competent person about his or her choices for medical treatment should he or she become unable to make such decisions or communicate them in the future.

INSTRUCTIONS

NEW YORK LIVING WILL – PAGE 1 OF 2

This Living Will has been prepared to conform to the law in the State of New York, as set forth in the case in re Westchester County Medical Center, 72 N.Y.2d 517 (1988) in that case the Court established the need for "clear and convincing" evidence of a patient's wishes and stated that the "ideal situation is one in which the patient's wishes were expressed in some form of writing, perhaps a 'living will'."

PRINT YOUR NAME

I, _____, being of sound mind, make this statement as a directive to be followed if I become permanently unable to participate in decisions regarding my medical care. These instructions reflect my firm and settled commitment to decline medical treatment under the circumstances indicated below:

I direct my attending physician to withhold or withdraw treatment that merely prolongs my dying, if I should be in an **incurable or irreversible mental or physical condition with no reasonable expectation of recovery**, including but not limited to: (a) a **terminal condition**; (b) a **permanently unconscious condition**; or (c) a **minimally conscious condition in which I am permanently unable to make decisions or express my wishes**.

I direct that my treatment be limited to measures to keep me comfortable and to relieve pain, including any pain that might occur by withholding or withdrawing treatment.

While I understand that I am not legally required to be specific about future treatments **if I am in the condition(s) described above I feel especially strongly about the following forms of treatment:**

I do not want cardiac resuscitation
I do not want mechanical respiration
I do not want artificial nutrition and hydration
I do not want antibiotics

However, I **do want** maximum pain relief, even if it may hasten my death.

CROSS OUT ANY STATEMENTS THAT DO NOT REFLECT YOUR WISHES

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NEW YORK LIVING WILL – PAGE 2 OF 2

ADD PERSONAL INSTRUCTIONS (IF ANY)

Other directions:

These directions express my legal right to refuse treatment, under the law of New York. I intend my instructions to be carried out, unless I have rescinded them in a new writing or by clearly indicating that I have changed my mind.

Signed _____ Date _____

Address _____

SIGN AND DATE THE DOCUMENT AND PRINT YOUR ADDRESS

WITNESSING PROCEDURE

YOUR WITNESSES MUST SIGN AND PRINT THEIR ADDRESSES

I declare that the person who signed this document appeared to execute the living will willingly and free from duress. He or she signed (or asked another to sign for him or her) this document in my presence.

Witness 1 _____

Address _____

Witness 2 _____

Address _____

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Courtesy of Caring Connections
1700 Diagonal Road, Suite 625, Alexandria, VA 22314
www.caringinfo.org, 800.658-8898

FIGURE 23.1 A sample living will. Because of differences in state law, each state has its own format for advance directives.

SOURCE: Valid copies of this and other state-specific advance directives can be found at www.caringinfo.org. Reprinted with permission of The National Hospice and Palliative Care Organization. Copyright © 2005 National Hospice and Palliative Care Organization. All rights reserved. Reproduction and distribution by an organization or organized group without the written permission of the National Hospice and Palliative Care Organization is expressly forbidden.

made by a competent person about choices for medical treatment should he or she become unable to make such decisions or communicate them at some time in the future.

Two forms of advance directives are legally important. First is the **living will**, which enables individuals to provide instructions about the kind of medical care they wish to receive (or not receive) if they become incapacitated or otherwise unable to participate in treatment decisions (Figure 23.1). Many people believe that living wills are appropriate only for stating a desire to forgo life-sustaining procedures or to avoid medical heroics when death is imminent; indeed, most standard forms for completing a living will reflect this purpose. In fact, however, a living will can be drafted to express very different ideas about the kinds of treatment a person would or would not want, and they can be written to cover various contingencies.

The second important form of advance directive is the **health care proxy**, which is also known as a *durable power of attorney for health care*. This document makes it possible to appoint another person to make decisions about medical treatment if you become unable to do so. This decision maker may be a family member, close friend, or attorney with whom you have discussed your treatment preferences. The proxy is expected to act in accordance with your wishes as stated in an advance directive or as otherwise made known. Only about

5% of the population will ever need a surrogate, but everyone should name one, just in case. If no proxy is chosen, most states assign the task to the patient's spouse or parents.

For advance directives to be of value, you must do more than merely complete the paperwork. Discuss your wishes ahead of time with caregivers and family members as well as with your physician. A number of forms have been developed to help people make an advance directive, including the popular "Five Wishes" form created by the nonprofit organization Aging with Dignity.

Even with an advance directive, a patient's wishes regarding avoiding aggressive medical interventions are frequently not followed. This is because when every minute counts, emergency

living will A type of advance directive that allows individuals to provide instructions about the kind of medical care they wish to receive, or not receive, if they become unable to participate in treatment decisions.

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health care proxy A type of advance directive that allows an individual to appoint another person as an agent in making health care decisions in the event he or she becomes unable to participate in treatment decisions; also known as a *durable power of attorney for health care*.

responders do not waste time looking for paperwork. Even if the advance directive is readily available, it does not constitute actual medical orders. For this reason, a separate document, called the Physicians Orders for Life Sustaining Treatment (POLST), has been developed and is available in most states. This document contains actual medical orders and is more likely to be followed, even in the event of an emergency situation. The POLST is intended primarily for people who are relatively near the end of life. In addition, people who are near the end of life and wish to avoid resuscitation and other forms of aggressive treatment often keep a signed document stating in bold letters “Do Not Resuscitate” or “Allow Natural Death” displayed in their home or hospital room.

Planning ahead means different things at different stages of life. For the elderly, or those with a potentially terminal illness, making specific plans for what lies ahead becomes an urgent matter. For most students reading this book, specific planning for your eventual death is probably not a reasonable priority. But thinking about some of these issues now will help you down the road both in dealing with your own life, as well as helping your loved ones as they near the end of their lives. Completing an advance directive is appropriate at any age. If you fill out an advance directive and share it with your parents (or grandparents), they may be encouraged to follow your example.

Giving the Gift of Life

People at all stages of life should consider the pros and cons of becoming an organ donor. A human body is a valuable resource. Of all the advances in medical techniques for helping patients who were formerly beyond recovery, perhaps the best known, and most effective, is the transplantation of human organs. Yet the demand for organs continues to drastically outpace the number of organ donations. Each day about 77 people receive an organ transplant while another 18 people on the waiting lists die because not enough organs are available. As of February 2012, more than 113,000 Americans were waiting for organ transplants. Many of these people will wait months or even years for a transplant, and many will die while they wait.

Organs and tissues that are used for transplant come from several sources. *Living donors* can donate a single kidney, and parts of organs such as the liver, lungs, intestine, and pancreas. Living donors can also donate blood and bone marrow. *Deceased donors* are the only source of hearts, whole lungs, or other body parts that can't be removed from living donors. Eyes, bone, tendons, skin, and heart valves are some of the tissues that can be donated. Organ and tissue donors are matched with potential recipients based on many factors including blood and tissue types. Generally the most successful transplants occur when the donor and recipient are as genetically similar as possible. To help prevent rejection, transplant recipients often must take powerful drugs to suppress their immune systems.

There are many reasons for the current shortage of donor organs. The number of people in need of transplants is growing because modern medical care tends to keep people with serious health problems alive longer. In addition, as transplant technology improves, more medical conditions can be treated effectively with transplantation. While the need for transplantation grows, the supply of organs has not kept pace. Not enough people register as donors. In addition, improved medical care of the victims of trauma, as well as widespread use of safety devices such as seat belts and motorcycle helmets, have reduced the number of individuals who become brain-dead, who might otherwise have been potential donors of many organs.

People of any age or health status can register as donors. Even an elderly person or someone with cancer may be able to donate some types of tissue. It is crucial that people of all ages, young and old, who are willing to donate organs and tissue, let their families know, and register as donors (see below). In particular, it is important that young people consider becoming donors. The sudden unexpected death of a young person, usually due to some form of trauma, is a horrendous tragedy to her or his family, friends, and society as a whole. But some good can come from such a loss by donating organs. Knowing that their loved one saved or improved the lives of many people can be a lasting comfort to grieving family and friends.

There are several longstanding myths and fears about organ donation. A common unfounded fear is that if you are seriously injured, physicians won't work as hard to save your life if they know you are a donor. This is definitely not true! Saving a life is always the first priority. Another common myth is that organ donation disfigures the body and makes an open casket funeral impossible. In fact, donated organs are removed surgically, which does not change the appearance of the body for the funeral service. In addition, some people are concerned that their religion may prohibit organ donation. When in doubt, it always makes sense to discuss this with your clergy; but all major organized religions approve of organ and tissue donation, and most consider it an act of great kindness and charity.

If you decide to become an organ donor, the first step is to indicate your wish by completing a **Uniform Donor Card** (Figure 23.2); alternatively, you can indicate your wish on your driver's license in many states. Because relatives are called on to make decisions about organ and tissue donation at the time of a loved one's death, your second step is to discuss your decision with your family. If your family does not know your wishes, they are likely to refuse organ donation. Surveys show

QUICK STATS

One deceased donor can save up to 8 lives through organ donation, and can save or improve the quality of 100 more people's lives through tissue donation.

—American Transplant Foundation, 2012

Uniform Donor Card A consent form authorizing the use of the signer's body parts for transplantation or medical research upon his or her death.

TERMS



Organ/Tissue Donor Card



I wish to donate my organs and tissues. I wish to give:

☐ any needed organs and tissues

☐ only the following organs and tissues:

Donor Signature _____ Date _____
Witness _____
Witness _____

FIGURE 23.2 A sample organ/tissue donor card.

SOURCE: U.S. Department of Health and Human Services (<http://www.organdonor.gov/donor/index.htm>).

that most Americans would donate a family member's organs if they knew that was what their loved one wanted.

Planning a Funeral or Memorial Service

Funerals and memorial services are rites of passage that commemorate a person's life and acknowledge his or her passing from the community. Funerals and memorials allow survivors to support one another as they cope with their loss and express their grief. The presence of death rites in every human culture suggests that they serve innate human needs.

Disposition of the Body When a death occurs, one of the immediate concerns of survivors is how to care for the body of their loved one. The care of the body after death varies greatly in different cultures. In the United States the body is usually taken away from the home, hospital, or other site of death within a matter of minutes or hours. The body is typically transported to a funeral home or mortuary, where it is prepared for burial or cremation.

People generally have a preference about the final disposition of their body. For most Americans, the choice is either burial or cremation. *Burial* involves a grave dug into the soil or entombment in a mausoleum. If the body is to be buried and the family wishes that the body be viewed during a wake or in an open casket funeral, **embalming** is generally done. This involves replacing body fluids with chemicals that disinfect and delay decomposition. Many of these fluids are toxic, and may pose environmental hazards as the body eventually decomposes and the chemicals slowly leach into the soil and water. Embalming is neither necessary nor legally required.

Bodies that are to be buried are generally placed in a casket, which can be made of almost anything from cardboard to steel. Caskets can cost thousands of dollars, and bereaved

family members are sometimes convinced by unscrupulous funeral homes to buy very expensive caskets that they cannot afford. No casket can prevent a body from decomposing. A less expensive and more environmentally friendly option is an inexpensive wooden or cardboard casket that can be draped with cloth or a flag if desired. Some religions, such as Judaism and Islam, mandate very simple burials, with plain wooden coffins (or no coffin at all) and no embalming.

Cremation involves subjecting a body to intense heat, thereby reducing its organic components to a mineralized skeleton. The remaining bone fragments are then usually put through a cremulator, which reduces them to a granular state, often referred to as ashes (which actually resemble coarse sand). Cremated remains can be buried, placed in a columbarium niche, put into an urn kept by the family or interred in an urn garden, or scattered at sea or on land. Cremation is now used in around 40% of deaths in the United States, with the rate of cremation increasing rapidly in recent years. In some parts of the United States, especially in the West, cremation is now more common than burial. Cremation costs considerably less than underground burial and has a lower environmental impact. Cremation is acceptable to many, but not all, religions.

Contrary to popular mythology, having a dead body in a home for a few hours, or even a few days, does not constitute a health risk. Keeping a loved one's body at home, at least for a few hours, can allow families to have a final chance to be with and care for the deceased. When the family is ready, the body can be transported for cremation or burial.

Arranging a Service Commemorating a person's life and death may involve a traditional funeral ceremony or a simple memorial service. Whereas the casketed body is typically present at a funeral, it is not at a memorial service. In some cases, both a funeral and a memorial service are held, the former occurring within a few days after death and the latter being held sometime later. Although some individuals express a preference for not having any sort of service, in general bereaved relatives and friends derive important benefits from having an opportunity to honor the deceased and express their grief through ceremony.

A funeral or memorial service can be a healing experience that allows loved ones to share memories and support one another. Memorial services can be held almost anywhere, including outdoors, in a home, or in a chapel. The service is often led by clergy, but many nontraditional services are led by a family member or close friend. The more the service fits the personality of the deceased person and meets the practical needs of the family, the better. A memory book or other photo display is common, and this helps bring back cherished memories of the person at different stages in his or her life. A home-based or outdoor service with a potluck meal or snacks afterward can be meaningful and healing while not placing a great financial burden on the grieving family.

People who have a terminal illness sometimes find comfort and satisfaction in helping to plan for their own memorial services. A memorial service can be the joint creation of the dying person and family members who wish to be part of

embalming The process of removing blood and other fluids and replacing them with chemicals to disinfect and temporarily retard deterioration of a corpse. Some of the chemicals used, such as formaldehyde, are toxic.

TERMS

CRITICAL CONSUMER

A Consumer Guide to Funerals



A traditional funeral with a casket costs about \$7000, and many funerals cost \$10,000 or more. When no preplanning has been done, as often occurs, family members have to make decisions under time pressure and in the grip of strong feelings. As a result, they may make poor decisions and spend more than they need to. To avoid these problems, millions of consumers are now making funeral arrangements in advance, comparing prices and services so they can make well-informed purchasing decisions. Many people see funeral planning as an extension of will and estate planning.

Alternatives to traditional funerals exist. Cremation is a much less expensive alternative to a traditional burial and is rapidly becoming nearly as common. A direct cremation (no service or visitation at the funeral home) can cost as little as \$600 in some cities. Cremated remains can be buried in a family plot or placed in a mausoleum, but many people choose to keep the ashes at home or scatter them in a beautiful location. Whole-body donation (usually to a medical school) is another option chosen by many people for altruistic reasons, as well as the fact that there is usually no cost. Another alternative to an expensive traditional funeral is a more personalized, "do-it-yourself" family-centered funeral, with minimal costs because most or all of the tasks needed to care for the deceased person are provided by family and friends.

To ensure that you make the best possible decisions when planning a funeral, follow these guidelines:

- Plan ahead. Think about what type of funeral you want, and ask your loved ones about their preferences.
- Shop around. If you are going to use a funeral home, look for one that belongs to the National Funeral Directors Association (NFDA), and compare prices from at least two funeral homes.

- Ask for a price list. The Funeral Rule requires funeral directors to give you an itemized price list when you ask either in person or over the telephone. Many funeral homes offer package funerals that cost less than individual items, but you may not need or want everything included in the package.
- Decide on the goods and services you want. Basic services include planning the funeral and coordinating arrangements with the cemetery or crematory. Embalming is not necessary or legally required if the body is buried or cremated shortly after death. The casket is usually the single most expensive item; an average casket costs slightly more than \$2000, but some caskets sell for as much as \$10,000. You do not have to buy the casket from the funeral home you use. Many "big box" stores now sell caskets at much lower cost than funeral homes.
- Resist pressure to buy goods and services you don't really want or need. Funeral directors are required to inform you that you need buy only those goods and services you want. If you feel you are being pressured, go elsewhere.
- In choosing a cemetery, take into consideration its location; its religious affiliation, if any; the types of monuments allowed; and cost. Visit the cemetery ahead of time to make sure it's suitable. If cremation is chosen, use of a cemetery is optional.
- Once decisions have been made, put them in writing, give copies to family members, and keep a copy accessible. It's a good idea to review these decisions every few years and revise them if necessary.



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TAKE CHARGE

Tasks for Survivors

Some of the following tasks must be attended to soon after a death occurs, whereas others take weeks or months to complete. Many of these tasks, especially those that need to be dealt with in the first hours and days following the death, can be taken care of by friends and relatives of the

immediate survivors. If the deceased person has been served by a hospice, the social worker has likely worked with the patient and family to make many of these plans ahead of time.

- Prepare a list of relatives, friends, and colleagues, and telephone them about the death as soon as possible. Friends can help with notifications.
- Find out if the deceased left instructions for disposition of the body or for a funeral or memorial service.
- If no prior plan exists, contact a funeral home, mortuary, or memorial society for help in making arrangements. Clergy, friends, and other family members can be asked to help decide what is most appropriate.
- If flowers are to be omitted from the funeral or memorial service, choose an appropriate charity or other memorial to which gifts can be made.
- Write the obituary. Consider including the deceased's age, birthplace, cause of death, occupation, academic degrees, memberships, military service, accomplishments, names and

relationships of nearest survivors, and the time and place of the funeral or memorial service. If a small funeral is planned, and you are notifying people by phone or e-mail, you can wait to write the obituary later, or skip it entirely. You can also use an online obituary website, and even create an online memorial to a loved one.

- Ask friends to help coordinate the supplying of meals for the first few days following the death, as well as the management of other household tasks and child care, if necessary. You can also ask friends to coordinate a potluck or catered meal if you wish to have a gathering after the funeral. Simple snacks and drinks are fine, if you choose.
- If you have relatives and friends who will be coming from out of town for the funeral, ask a friend or family member to help with arrangements for lodging and transportation to and from the airport.
- If a funeral ceremony is planned, choose the individuals who are to be pallbearers, and notify them that you would like their participation.
- Gather photos or other mementos for a memory book, memory board, or memorial website.
- Do you want to have a small booklet with information about the deceased and perhaps a photo or poem to give to mourners at the funeral or memorial service? If so, get help from family members and friends to create the pamphlet and have it printed.

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Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever been involved in a funeral? What role did you play? Did you feel that the service reflected the values and beliefs of the deceased person? Did the experience cause you to think about your own funeral and what it should be like?

the project. Making at least some plans ahead of time can help ease the burden on survivors, who will undoubtedly face a great number of tasks and decisions when the death occurs (see the box "Tasks for Survivors"). If your loved one has hospice care, the social worker and chaplain can often help guide you through the process of planning a memorial service.

COPING WITH DYING

There is no one right way to live with or die of a life-threatening illness. Every disease has its own set of problems and challenges, and each person copes with these problems and

challenges in his or her own way. Much of the suffering experienced by people with a life-threatening illness comes from overwhelming feelings of loss on all levels. Besides the many physical and emotional losses, there are usually concerns about costly medical care, loss of income, hospitalization, and physical pain. How a person copes with such an experience is likely to reflect his or her personality and life history, as well as the nature of family relationships and patterns of interaction in the person's wider social environment. Spiritual strength can be a major factor in how we deal with these losses. The support of loving family, friends, clergy or other spiritual guides, and health care professionals including a hospice team, can make the journey easier to bear.

Awareness of Dying

Living with an illness that is life-threatening and incurable can be described as a living-dying experience. From the time discomforting symptoms are first noticed and a person's worst fears are confirmed by a diagnosis, through the ups and downs of treatment, and on to the final days or hours of life, hope and honesty are often delicately balanced—honesty to face reality as it is, and hope for a positive outcome. The object of hope changes. The early hope that the symptoms are not really serious gives

EMBRACING WELLNESS

In Search of a Good Death



Participants in a landmark study were asked to discuss the deaths of family members, friends, or patients and reflect on what made their deaths good or bad. From these discussions, six major themes emerged as components of a good death.

- *Pain and symptom management:* Many people fear dying in pain, and portrayals of bad deaths usually included inadequate pain management. When reassured that pain could be managed, patients were less anxious.
- *Clear decision making:* Both providers and families feared entering a medical crisis without knowing the patient's preferences. Patients and families who had good communication with health care providers and had discussed treatment decisions ahead of time felt empowered, and providers felt they were giving good care. Tolerance for uncertainty may increase if values and preferences are clarified.
- *Preparation for death:* Patients expressed satisfaction when they had time to prepare their wills and help plan their funeral arrangements. Patients and families also wanted to know what to expect during the course of the illness and what physical and psychosocial changes would take place as death approached. It was important for providers and families to have reached some personal comfort with death so they felt prepared when death occurred.
- *Completion:* the opportunity to review one's life, resolve conflicts, spend time with loved ones, and say good-bye. Participants confirmed the deep importance of spirituality or meaningfulness at the end of life. Many times, patients were able to view their

experience of dying as part of a broader life trajectory and thus continue to grow emotionally and spiritually in their last days. Issues of faith were often mentioned as important to healing, but participants emphasized that the cues about the particular expression of faith must be taken from the patient.

- *Contributing to others:* Patients wanted to know that they still had something to offer to others, whether it was making someone laugh or lightening the load of someone closer to death. Many patients found that as they reflected on their lives, what they valued most was their personal relationships with family and friends, and they were anxious to impart this wisdom to others.
- *Affirmation of the whole person:* Patients appreciated empathic health care providers, and family members were comforted by those who treated their loved ones as unique and whole people, rather than as a disease. The quality of dying is related to the acknowledgment that people die in character—that is, as an extension of who they have been in their lives.

The study affirmed that most people think of death as a natural part of life, not as a failure of technology. Although the biomedical aspects of end-of-life care are crucial, they merely provide a point of departure toward a good death. When pain is properly managed and the practical aspects of dying are taken care of, patients and their families have the opportunity to address the important emotional, psychological, and spiritual issues that all human beings face at the end of life.

way to hope that a cure is possible. When the illness is deemed incurable, there is hope for more time. As time begins to run out, one hopes for a pain-free death—a “good death” (see the box “In Search of a Good Death”).

Often the process of coping involves what psychiatrist Avery Weisman described as **middle knowledge**. Patients and their families seek a balance between sustaining hope and acknowledging the reality of the disease process. Maintaining a sense of self-worth, setting goals and striving to reach them, engaging in fruitful interactions with our environment—all of these reflect a coping strength that sustains the will to live fully despite a bleak prognosis.

The Tasks of Coping

In her groundbreaking 1969 book *On Death and Dying*, Elisabeth Kübler-Ross, a Swiss American psychiatrist and one of the first medical experts to focus on the topic of end of

life, suggested that the response to an awareness of imminent death involves five psychological stages: denial, anger, bargaining, depression, and acceptance. The notion that these five stages occur in a linear progression has since become a kind of modern myth of how people *ought* to cope with dying. Unfortunately this can lead to the idea that it is a person's task to move sequentially through these stages, one after another, and that if this is not accomplished, the person has somehow failed. In fact, however, Kübler-Ross said that individuals go back and forth among the stages during the course of an illness, and different stages can occur simultaneously.

The stage-based model devised by Kübler-Ross more than three decades ago has been a stimulus toward a better understanding of how people cope with dying. Today the notion of stages has been deemphasized in favor of highlighting the tasks that require attention in order to cope well with a life-threatening illness. Psychologist and author Charles Corr, for example, distinguishes four primary dimensions in coping with dying:

1. *Physical:* satisfying bodily needs and minimizing physical distress.
2. *Psychological:* maximizing a sense of security, self-worth, autonomy, and richness in living.

middle knowledge A state of knowing in which a person both acknowledges the reality of a threatening situation and maintains hope for a positive outcome.

TERMS

3. **Social:** sustaining significant relationships and addressing the social implications of dying.
4. **Spiritual:** identifying, developing, or reaffirming sources of meaning and fostering hope.

Helping a dying person, and her or his loved ones, requires attention and support to all four of these dimensions.

In addition, though, we must remember that a person's death is as unique as his or her life. Thus, although models can help us gain understanding, they need to be balanced by paying attention to the dying person's own unfolding life story. Each person's pathway through life-threatening illness is determined by factors such as the specific disease and its course, his or her personality, and the available supportive resources.

People who apparently cope best with life-threatening illness often exhibit a fighting spirit that views the illness not only as a threat but also as a challenge. These people strive to inform themselves about their illness and take an active part in treatment decisions. They are optimistic and have a capacity to discover positive meaning in ordinary events. Holding to a positive outlook despite distressing circumstances involves creating a sense of meaning that is bigger than the threat. In the context of life-threatening illness, this encompasses a person's ability to comprehend the implications an illness has for the future, as well as for his or her ability to accomplish goals, maintain relationships, and sustain a sense of personal vitality, competence, and power. Although life-threatening illness disrupts virtually all aspects of a person's life, there is a vital link between finding meaning and achieving a sense of mastery.

Supporting a Person in the Last Phase of Life

People often feel uncomfortable in the presence of a person who is in the final stage of life. How should we act? What can we say? Perhaps the most important and comforting thing we can do for a dying person is to simply be present. Sitting quietly and listening carefully, we can take our cues from the person who is dying. If the person is capable of speaking, and wishes to talk, attentive listening is an act of great kindness. If the person doesn't wish to talk, or is not able to, physical touch such as holding hands or putting a hand on the person's shoulder can be the most effective way to express your love and concern.

Attempting to cheer up a dying person by saying something like "you are going to be just fine" or "you can fight this and be well again" can be frustrating for a patient at the end of life, who knows that your words are simply not true. You cannot fix all the difficulties your dying loved one is facing, but you can listen, and show by your loving presence that you care. Speaking simply and from the heart can be a healing experience for us and for the loved one whose time is short.

The level of alertness of a dying person often fluctuates. It is not unusual for a patient who has been nonverbal to have moments of clear speech in the days or hours before death. People with dementia may have lucid periods from time to time. Even if a person appears to be in a coma or deep sleep, they may be able to hear what is going on around them. Most



The simple act of listening can be extremely supportive to someone who is facing death.

experts think that hearing and touch are the last senses to go. Always assume that a dying person can hear what you say; be sure to keep that in mind when you speak to others in the room. Don't hesitate to speak lovingly to a dying person whether or not she or he shows outward signs of hearing you.

Besides the loving presence of friends and family, the dying person may need other supportive resources. Trained individuals who have experience with dying patients, such as clergy and hospice workers, can provide invaluable support for dying people and their families.

The Trajectory of Dying

Our expectations about dying may be quite different from what most people actually experience. The concept of a **trajectory of dying** is useful for understanding people's experiences as they near death. Although sudden death from an

trajectory of dying The duration and nature of a person's experience in approaching death as influenced by the underlying cause of dying.

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unexpected cause—a massive heart attack or an accident, for example—is one type of dying trajectory, our focus here is on deaths that occur when there is forewarning. Among these, some trajectories involve a steady and fairly predictable decline. This is the case with many cancers, which tend to follow the course of a progressive disease with a terminal phase. Other kinds of advanced, chronic illness involve a long period of slow decline marked by episodes of crisis, the last of which proves to be fatal.

We can also distinguish between different stages in a dying trajectory—namely, a period when a person is known to be terminally ill but is living with a life expectancy of perhaps weeks or months, possibly years, and a later period when dying is imminent and the person is described as actively dying. The way in which such trajectories are estimated—their duration and expected course—can affect both patients and caregivers and influence their actions. Deaths that happen much sooner or much later than expected by the patient and family may pose special difficulties. A family may experience more shock and guilt if the death occurs before they have had time to “say their good-byes” and emotionally prepare for the loss of their loved one. When death is slow in coming, and the dying individual lingers for days, weeks, or months longer than anticipated, families and the dying person may become physically, emotionally, and spiritually exhausted. The support of extended family, friends, hospice, and clergy can make the difference between an unbearable situation and one that is tolerable. In the best scenarios, the dying process can be a time when bonds of family and friendship are strengthened, and personal growth occurs for the dying individual and his or her loved ones.

When a person is actively dying, his or her death is expected to occur within hours or, at most, a few days. During the last phase of a fatal illness, a dying person may exhibit irregular breathing or shortness of breath, decreased appetite and thirst, nausea and vomiting, incontinence, restlessness and agitation, disorientation and confusion, and diminished consciousness. These symptoms usually can be managed by skilled palliative care. Pain, if it is present, should be treated aggressively as part of a comprehensive approach to comfort care. Narcotic pain medications are generally the most effective and are routinely used at the end of life at whatever dose is needed to provide the pain control that the patient desires. The stopping of eating and drinking is a normal part of the last phase of a terminal condition. As the body shuts down,

food cannot be assimilated and may only contribute to the patient's discomfort. Forcing food or liquids often results in choking or nausea. If a person's mouth is dry, giving ice chips, dropping small amounts of water into the mouth from a straw or syringe, or using a moistened swab can help.

As death is drawing near, the patient's extremities may feel cold to the touch; lips, fingers, and toes may appear bluish; urination becomes less frequent; and the ability to communicate may be lost. In the final hours, purple blotches (mottling) may appear on the legs or arms. Simple steps—such as repositioning the patient, covering him or her with a light blanket, dimming the room's lighting, playing soft favorite music, or holding hands—can provide great relief and reassurance in the last moments. Just before death, the person may take a deep breath and sigh or shudder.

It is not unusual for a dying person to seem to wait until loved ones have left the room before taking her or his last breath. You should not feel guilty or rejected if you are not present at the moment of death. Some dying people seem to need to be alone in the moment of passing. The Hollywood version of death, where the dying person speaks meaningful last words to loved ones, then dies immediately, is much less common than a period of hours or days of apparent unresponsiveness before death finally comes.

COPING WITH LOSS

Even if we have not experienced the death of someone close, we are all survivors of losses that occur in our lives because of changes and endings. The loss of a job, the ending of a relationship, transitions from one school or neighborhood to another—these are examples of the kinds of losses that occur in all our lives. Such losses are sometimes called little deaths, and in varying degrees they all involve grief.

For many of us, our first really significant loss is the death of a pet. The intensity of grief after losing a beloved companion animal is often comparable to the grief experienced following the loss of a human loved one. Never assume that the loss of a pet is “no big deal—you can always get another one.” The pain following loss of a pet may be made even harder to bear if the experience of the grieving person is belittled. The comments here about grief are relevant to many types of loss, not just the loss of a human friend or relative.

Experiencing Grief

Grief is the reaction to loss. It encompasses thoughts and feelings as well as physical and behavioral responses. Mental distress may involve disbelief, confusion, anxiety, disorganization, and depression. The emotions that can be present in

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

What is your notion of a “good death”? In what setting does it take place, and who is there? In the last days of your life, what do you think you'll need to say, and to whom will you want to say it? If you were terminally ill, what would be the most supportive things others could do for you?

grief A person's reaction to loss as manifested physically, emotionally, mentally, and behaviorally.

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normal grief include not only sorrow and sadness, but also relief, anger, guilt, and self-pity, among others. Bereaved people experience a range of feelings, even conflicting ones. Observing the faces of families at the funeral of a beloved relative often reveals smiles and moments of laughter in addition to solemn expressions and tears. Recognizing that grief can involve many different feelings—not just sadness—makes us more able to cope with it. Common behaviors associated with grief include crying, searching for the deceased, and talking repetitively about the deceased and the circumstances of the death. Bereaved people may be restless, as if not knowing what to do with themselves. Outward signs of grief may involve frequent sighing, crying, inappropriate laughter, insomnia, loss of appetite, and marked fatigue. Grief may also evoke a reexamination of religious or spiritual beliefs as a person struggles to make meaning of the loss. Guilt is a common emotion after the death of a loved one. People may blame themselves in some way for the death, or for not doing enough for the deceased, or for feeling a sense of relief that their loved one is gone. All such manifestations of grief can be present as part of our total response to **bereavement**—that is, the event of loss.

Mourning is closely related to grief and is often used as a synonym for it. However, mourning refers not so much to the *reaction* to loss but to the *process* by which a bereaved person adjusts to loss and incorporates it into his or her life. How this process is managed is determined, at least partly, by cultural and gender norms for the expression of grief.

The Course of Grief Grieving, like dying, is highly individual. In the first hours or days following a death, a bereaved person is likely to experience shock and numbness, as well as a sense of disbelief, especially if the death was unexpected. Consider the ways in which people die: a young child pronounced dead on arrival after a bicycle crash; an aged grandmother dying quietly in her sleep; a despondent executive who commits suicide; a young soldier killed in battle; a chronically ill person who dies a lingering death. The cause or mode of death—natural, accidental, homicide, or suicide—influences how grief is experienced. Even when a death is anticipated, grief is not necessarily diminished when the loss becomes real.

The death of a loved one is frequently a severe physical as well as emotional stressor. For example, the rate of heart attack in the first day after the death of a significant person in one's life increases by as much as 21 times. The risk gradually decreases over time, but still remains above normal for several months after a loved one dies. After a death, grieving people often have difficulty sleeping, may neglect to eat nourishing food, and may forget to take their usual medications. These

factors add to the health risks associated with recent loss. Recent loss also has a cognitive impact on many grievers. People often report that they feel confused and have difficulty concentrating following a significant loss.

After the initial shock begins to fade, the course of grief is characterized by anxiety, apathy, and pining for the deceased. The pangs of grief are felt as the bereaved person deeply experiences the pain of separation. There is often a sense of despair as a person repeatedly goes over the events surrounding the loss, perhaps fantasizing that somehow everything could be undone and be as it was before. During this period, the bereaved person may also begin to look toward the future and take the first steps toward building a life without the deceased.

Psychiatrist Colin Murray Parkes points to three main influences on a person's course of grieving:

1. The urge to look back, cry, and search for what is lost.
2. The urge to look forward, explore the world that emerges out of the loss, and discover what can be carried forward from the past into the future.
3. The social and cultural pressures that influence how the first two urges are inhibited or expressed.

As these influences interact in various ways, at times the bereaved tries to avoid the pain of grief and at other times confronts it. The goal is to achieve a balance between avoidance and confrontation that facilitates coming to terms with the loss. Attaining this goal can be seen as an oscillation between what researchers Margaret Stroebe and Henk Schut call *loss-oriented* and *restoration-oriented* mourning. From this perspective, looking at old photographs and yearning for the deceased are examples of loss-oriented coping, whereas doing what is needed to reorganize life in the wake of the loss—for example, learning to do tasks that the deceased had always managed, such as finances—is part of restoration-oriented coping.

As time goes on, the acute pain and emotional turmoil of grief begin to subside. Physical and mental balance are reestablished. The bereaved person becomes increasingly reintegrated into his or her social world. Sadness doesn't go away completely, but it recedes into the background much of the time. Although reminders of the loss stimulate waves of active grieving from time to time, the main focus is the present, not the past. Adjusting to loss may sometimes feel like a betrayal of the deceased loved one, but it is healthy to engage again in ongoing life and the future (see the box "Coping with Grief").

Social support for the bereaved is as critical during the later course of grief as it is during the first days after a loss. In offering support, we can reassure the grieving person that grief is normal, permissible, and appropriate. The first anniversary and major holidays following a significant loss can be times of renewed grieving when the support of others is important and appreciated. Knowing that others remember the loss and that they take time to connect is usually perceived as comforting.

Bereaved people may find it helpful to share their stories and concerns through organized support groups. Hospices provide bereavement support groups and counseling. Many online and in-person support groups are organized around

bereavement The objective event of loss.

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mourning The process whereby a person actively copes with grief in adjusting to a loss and integrating it into his or her life.



- Recognize and acknowledge your loss.
- React to grief in the way that feels most natural to you. There is no “right” way to grieve.
- Take time for nature’s process of healing. The odds are good that you will be functioning well again before long. Be patient with yourself.
- Know that powerful, overwhelming feelings will change with time. Grief is often experienced as a long series of ups and downs, with the intensity of feelings gradually decreasing over time.
- Beware of the lure of drugs and alcohol to reduce the pain of your grief, especially if you have had substance abuse issues in the past. Using alcohol or drugs to numb yourself will ultimately backfire and make your recovery more difficult.
- Honor your loved one in a way that is meaningful to you. Consider creating a small memorial with a photo and flowers, start a scholarship in your loved one’s name, plant a memorial tree, or write a song or poem in his or her honor.

- Consider joining a bereavement support group to connect with others who have also had recent losses.
- Surround yourself with life: plants, animals, friends, and family.
- If you are having difficulty functioning at school, work, or home after a few weeks, consider counseling or a support group.
- People who have had a recent loss are at higher risk for suicide. If you are having thoughts of suicide, or feeling hopeless, seek help right away.
- Care for yourself by finding time to eat, sleep, and move your body.
- Don’t be afraid to let laughter and joy remain in your life. Experiencing positive feelings during mourning does not indicate a lack of respect or love for the deceased.

specific types of bereavement. The Compassionate Friends, for example, is a nationwide organization composed of parents who have experienced a child’s death. This organization provides both local and online support groups. The American Association of Suicidology has an online directory of suicide survivor support groups. Losing a loved one to suicide is an especially traumatic loss that is often best understood by others who have had a similar loss. Suicide support groups are available in most communities. If you have lost a loved one to drugs or alcohol, GRASP (Grief Recovery After Substance Passing) has support groups in many communities as well as online support. (See the end of this chapter for web addresses for these groups.)

Supporting a Grieving Person

When a person finds out that a loved one has died, the initial reaction may be profound shock and overwhelming distress. Such a person may initially respond best to the physical comfort of hugging and holding. Later, simply listening may be the most effective way to help. Talking about a loss is an important way that many survivors cope with the changed reality, and they may need to tell their story over and over. The key to being a good listener is to avoid speaking too much, and to refrain from making judgments about whether the thoughts and feelings expressed by a survivor are right or wrong, good or bad. The emotions, thoughts, and behaviors evoked by loss may not be the ones we expect, but they can nonetheless be valid and appropriate within a survivor’s experience of loss.

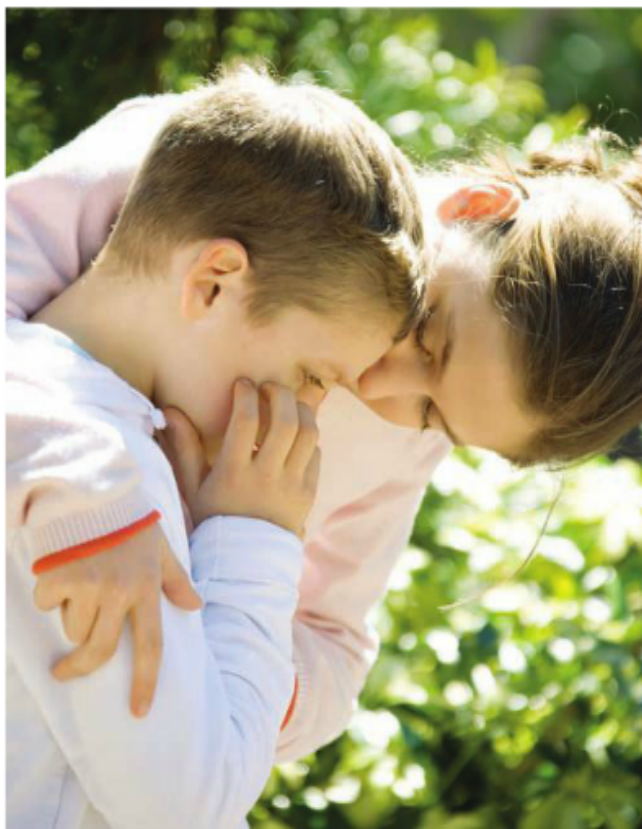
If a grieving friend or relative talks about suicide, or seems in danger of causing harm to him or herself or others, seek professional help right away. Most people are resilient and

cope well with loss, but keep in mind that the recent loss of a loved one is a major risk factor for suicide and self-harm. Be alert to signs that a grieving person is in serious danger.

While some people respond to loss with a feeling of helplessness, other people may react by taking charge. Making arrangements, taking care of tasks, and generally keeping busy may help them cope. Be aware that some people do not find it helpful to dwell on their feelings or talk a lot about their loss. Find out what *they* want to do—when the time is right, take a walk, go shopping together, go to a ball game, or see a movie. Your companionship while doing everyday activities may be the best gift you can give. Remember also that some grieving people may not appear sad or distressed. This does not mean that they didn’t care about the deceased, are “in denial,” or have a cold personality. Accept that this is their way of coping with loss and show your support with your loving presence.

When a Young Adult Loses a Friend

Among young people between the ages of 18 and 24 in the United States, the three leading causes of death tend to be sudden and unexpected: unintentional injuries, homicide, and suicide. Losing a close friend to an unexpected death can be particularly traumatic. There is usually an outpouring of sympathy and support toward the family of the deceased, but as a friend, you may feel left out and unsupported. Also, it is common to blame yourself in some way for your friend’s death or feel that you should have somehow prevented the tragedy. If you lose a friend, be sure to look for support from friends, family, clergy, or health professionals, especially if the intense sadness or guilt feelings last for more than a few



Children are better able to cope with loss when they are included in their family's experience of grief and mourning.

days or weeks. Friends can often help each other by working together to create their own way of celebrating the life of their lost friend.

Helping Children Cope with Loss

Children tend to cope with loss in a healthier fashion when they are included as part of their family's experience of grief and mourning. Although adults may be uncomfortable about sharing potentially disturbing or painful news with children, a child's natural curiosity usually negates the option of withholding information. Mounting evidence shows that it is best to include children from the beginning—as soon as a terminal prognosis is made, for example—to help them understand what is happening. Children should spend time with

the dying person, if possible, to learn, share, and offer and receive comfort.

In talking about death with children, the most important guideline is to be honest. Set the explanation you are offering at the child's level of understanding. Find out what the child wants to know. In general, it's advisable to keep the explanation simple, stick to basics, and verify what the child has understood from your explanation. A child's readiness for more details can usually be assessed by paying attention to his or her questions.

COMING TO TERMS WITH DEATH

We may wish we could keep death out of view and not make a place for it in our lives. But this wish cannot be fulfilled. With the death of a beloved friend or relative, we are confronted with emotions and thoughts that relate not only to the immediate loss but also to our own mortality.

Our encounters with dying and death teach us that relationships are more important than things and that life offers no guarantees. In discovering the meaning of death in our own lives, we find that life is both precious and precarious.

Allowing ourselves to make room for death, we discover that it touches not only the dying or bereaved person and his or her family and friends but also the wider community of which we are all part. We recognize that dying and death offer opportunities for extraordinary growth in the midst of loss. Denying death, it turns out, results in denying life.

TIPS FOR TODAY AND THE FUTURE

Facing death clear-sightedly, despite our fears and discomfort, can deepen our appreciation of life.

RIGHT NOW YOU CAN:

- Think about life's impermanence and appreciate the now.
- Don't miss out on opportunities to let your friends and loved ones know that you care for them. Let your awareness of death guide you into leading a loving and purposeful life.
- Consider organ donation as a lasting gift of life to others. If you want to be an organ donor, make the appropriate arrangements now, as described in this chapter.

IN THE FUTURE YOU CAN:

- Talk to your parents or grandparents about their wishes for the end of life. Let them know you care for them and want to be involved. Suggest that you look together at an advanced directive form, such as the "Five Wishes."
- Make a difference for a grieving friend or relative. Show that you care by your loving presence and your willingness to listen quietly.

Ask Yourself

QUESTIONS FOR CRITICAL THINKING AND REFLECTION

Have you ever been in the position of being supportive to a bereaved person? What kind of support did he or she seem to appreciate most? Why do you think that was the case? How did the experience affect you?

Connect to Your Choices

Have you ever thought about where you get your attitudes toward death? Many factors can influence our attitudes, some not as obvious as others. Have your parents or grandparents talked with you about advance directives or their end-of-life wishes? Has your religious upbringing taught you a particular view of death and an afterlife? Have you gotten the idea from the mainstream culture that it's best not to think or talk about death?

What are the external factors that influence your attitudes toward death? What are your inner motivations and core values, and how do they affect your attitudes? Based on what you learned in this chapter, will you make some different choices in the future? If so, what will they be?

Go online to Connect to complete this activity:
www.mcgraw-hillconnect.com

SUMMARY

- Although death makes rational sense in terms of species survival and evolution, there may be no completely satisfying answer to the question of why death exists from a personal point of view.
- Dying and death are more than biological events; they have social and spiritual dimensions.
- The traditional criteria for determining death focus on vital signs such as breathing and heartbeat. Brain death is characterized by a lack of physical responses other than breathing and heartbeat, with absence of brain activity as signified by a flat electroencephalogram (EEG).
- Between ages 6 and 9, most children begin to develop an understanding that death is final, universal, and inevitable.
- A mature understanding of death can include ideas about the survival of the human personality or soul after death. Problems arise when avoidance or denial of death fosters the notion that it happens only to others.
- A will is a legal instrument that governs the distribution of a person's estate after death.
- End-of-life care may involve a combination of home care, hospital stays, and hospice or palliative care.
- Palliative care is devoted to making dying patients comfortable by controlling pain and relieving suffering.
- Hospice programs apply a team-oriented approach to caring for dying patients and their families with the goal of helping people live as fully as possible until the end of their lives.
- Exercising choices about end-of-life care can involve making decisions about attempting to prolong life or choosing to allow natural death with comfort care.

- The practice of withholding or withdrawing potentially life-sustaining treatment is sometimes termed passive euthanasia.
- Physician-assisted suicide occurs when a physician provides lethal drugs or other interventions, at a patient's request, with the understanding that the patient plans to use them to end his or her life. Voluntary active euthanasia refers to the intentional ending of a patient's life, at his or her request, by someone other than the patient.
- Advance directives, such as living wills, are used to express people's wishes about the use of life-sustaining treatment and how they wish to be treated if they cannot speak for themselves.
- People can donate their bodies or specific organs for transplantation and other medical uses after death. People of all ages can make their wishes to donate their organs known on their driver's license or other state forms. They also need to let their families know that they wish to be organ donors.
- For Americans, the decision about what to do with the body after death usually involves either burial or cremation.
- Bereaved people usually benefit from participating in a funeral or other type of memorial service to commemorate a loved one's life and death.
- Coping with dying involves physical, psychological, social, and spiritual dimensions.
- It is useful for patients and caregivers to understand the trajectory, or course, of dying.
- In offering support to a dying person, the gift of listening can be especially important.
- Grief encompasses thoughts and feelings as well as physical and behavioral responses.
- Mourning, the process by which a person integrates a loss into his or her life, is determined partly by social and cultural norms for expressing grief.
- Children tend to cope with death in a healthier fashion when they are included in their family's experience of grief and mourning.
- Dying and death offer opportunities for growth in the midst of loss.

FOR MORE INFORMATION

BOOKS

- Albom, M. 2005. *Tuesdays with Morrie: An Old Man, a Young Man, and Life's Greatest Lesson*. New York: Anchor. A young man reconnects with an old professor in his last months of life and learns some of the greatest lessons that life has to offer.
- Batuello, J. T. 2003. *End of Life Decisions: A Practical Guide*. College Station, TX: Virtualbookworm. A guide to end-of-life decisions, including those related to pain relief and palliative and hospice care.
- Bonanno, G. A. 2009. *The Other Side of Sadness: What the New Science of Bereavement Tells Us about Life after Loss*. New York: Basic Books. This book explains modern thinking about grief and resilience, with many

vignettes. Very readable and encouraging—highly recommended for anyone who has experienced a recent loss.

Callanan, M., and Kelley, P. 1992. *Final Gifts: Understanding the Special Awareness, Needs, and Communications of the Dying*. New York: Bantam Books. Real stories of the experience of dying people and their loved ones told by two hospice nurses. No sugar-coating, yet still uplifting. A classic in the field, and a must read for families and friends of the dying.

DeSpelder, L. A., and A. L. Strickland. 2011. *The Last Dance: Encountering Death and Dying*, 9th ed. New York: McGraw-Hill. A comprehensive and readable text highlighting a broad range of topics related to dying and death.

Dunn, H. 2009. *Hard Choices for Loving People*. Lansdowne, VA: A & A Publishers. This book, written by a hospice chaplain, helps families make difficult decisions about medical care for a dying loved one, including use of CPR, artificial ventilation, artificial feeding, and other means of life support. Written in a very simple, straightforward, and comforting manner.

Karnes, B. 1986, revised 2009. *Gone from My Sight: The Dying Experience*. Vancouver: BK Books. This booklet is distributed to the families of dying patients by many hospices across the country. Hospice workers refer to it simply as "the blue book." By explaining in simple, straightforward terms the process of dying, it is an invaluable resource in helping to alleviate a family's fears of the unknown.

Nuland, Sherwin. 1993. *How We Die: Reflections on Life's Final Chapter*. New York: Random House. This book, written by an American surgeon and bioethicist, describes in detail the process of how we actually die from the most common diseases. The book, a National Book Award Winner, is clinically exact, at times disturbing, yet poetic, spiritual, and uplifting.

Shannon, J. B. 2006. *Death and Dying Sourcebook*, 2nd ed. Detroit: Omnigraphics. A wide-ranging discussion of topics relating to terminal illness, care for the dying, and the practical realities of death.

Slocum, J. and Carlson, L. 2011. *Final Rights: Reclaiming the American Way of Death*. Hinesburg VT: Upper Access Publishing. Discusses how families can assert their rights by taking control of the funeral process. Topics include avoiding being taken advantage of by the funeral industry, green burial, home funerals, and a listing of funeral-related state laws.

Turner, M. 2006. *Talking with Children and Young People about Death and Dying*, 2nd ed. London: Jessica Kingsley Publishers. A workbook designed to help parents explain death, loss, and grief to their children.

ORGANIZATIONS AND WEBSITES

Aging with Dignity: Five Wishes. Source for an advanced directive that includes designation of a health care proxy (durable power of attorney), the kind of medical treatment you want or don't want, your wishes about pain control, how you want people to treat you, and what you want your loved ones to know when you are dying.

<http://www.agingwithdignity.org/five-wishes.php>

American Association of Suicidology. Information and help for people who have lost loved ones to suicide. Contains a variety of resources, including a directory of support groups.

<http://www.suicidology.org/suicide-loss-survivors>

Association for Death Education and Counseling (ADEC). Provides resources for education, bereavement counseling, and care of the dying.

<http://www.adec.org>

Caring Connections (a program of the National Hospice and Palliative Care Organization). Provides resources for end-of-life decision making

with the goal of planning before a crisis occurs. Information about state-specific advance directives. Hotline and multilingual line available.

<http://www.caringinfo.org/i4a/pages/index.cfm?pageid=1>

The Compassionate Friends. Provide grief support after the death of a child, including local chapters and online support groups.

<http://www.compassionatefriends.org/home.aspx>

The Dougy Center. Offers education about childhood bereavement and support groups for bereaved children, teens, young adults, and parents.

<http://www.dougy.org>

Dying Well. A website focused on wellness through the end of life.

<http://www.dyingwell.org>

Funeral Consumers Alliance. A site with extensive information about how to plan a dignified family-centered funeral, details of cremation and burial, and dealing with death and grief.

<http://www.funerals.org/>

GRASP: Grief Recovery After a Substance Passing. Website for friends and family of people who have died as a result of substance use. Local and online support groups available.

<http://grasphelp.org/>

GriefNet. A site where you can communicate with others via e-mail support groups in the areas of death, grief, and major loss.

<http://www.griefnet.org>

Growth House. Offers an extensive directory of Internet resources relating to life-threatening illness and end-of-life care.

<http://www.growthhouse.org>

Hospice Foundation of America. Promotes the hospice concept of care through education and leadership.

<http://www.hospicefoundation.org>

National Cancer Institute: Grief, Bereavement and Coping with Loss. Provides extensive information about types of grief reactions, complicated grief, treatment for complicated grief, children and loss, and cultural aspects of grief.

<http://www.cancer.gov/cancertopics/pdq/supportivecare/bereavement/Patient>

National Funeral Directors Association (NFDA). Provides resources related to funerals and funeral costs, body disposition, and bereavement support.

<http://www.nfda.org>

National Hospice and Palliative Care Organization (NHPCO). Provides information about hospice care and advance directives, including an online national directory of hospices listed by state and city.

<http://www.nhpco.org>

Nolo Press: Wills and Estate Planning. Provides answers to questions about planning for death, from writing a basic will to organ donation.

<http://www.nolo.com>

On Our Own Terms: Public Broadcasting System. A companion website to the Bill Moyers PBS series on improving end-of-life care.

<http://www.pbs.org/wnet/onourown/terms>

The following organizations provide information about organ donation and donor cards.

Coalition on Donation

<http://www.donatelife.net>

Organ Procurement and Transplantation Network

<http://www.organdonor.gov/index.html>

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NUTRITIONAL CONTENT OF COMMON FOODS

If you are developing a behavior change plan to improve your diet, or if you simply want to choose more healthful foods, you may want to know more about the nutritional content of common food items. You can look up the nutrient content of the foods you eat in the USDA Agricultural Research Service National Nutrient Database for Standard Reference (<http://www.ars.usda.gov/Services/docs.htm?docid=17477>), which lists foods both by description and by nutrient content. For example, under “protein,” you can find out how much protein there is in a chicken pot pie or what foods have the most protein per serving. Although cumbersome, the database is comprehensive.

You can also track your daily food intake, calculate your nutrient intake from foods, and compare your intake with MyPlate recommendations for your age, sex, height, and weight at the MyPlate SuperTracker website (<https://www.choosemyplate.gov/SuperTracker/default.aspx>). This site provides tools for tracking your activity level, weight goals, and other aspects of your health status.

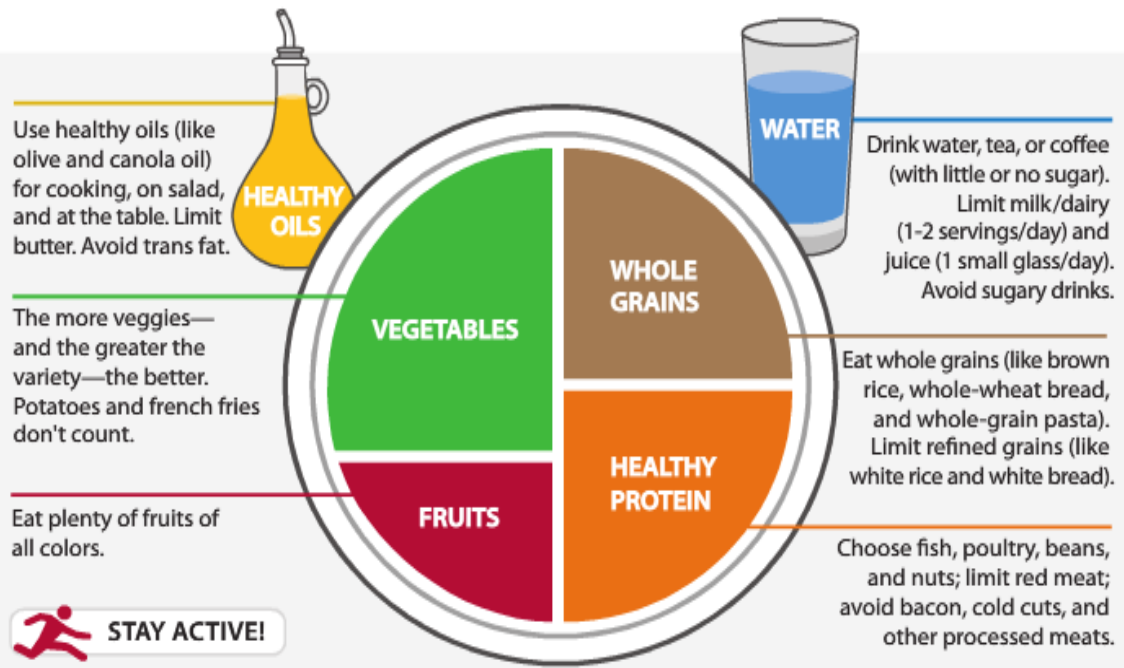
NUTRITIONAL CONTENT OF POPULAR ITEMS FROM FAST-FOOD RESTAURANTS

Although most foods served at fast-food restaurants are high in calories, fat, saturated fat, cholesterol, sodium, and sugar, some items are more healthful than others. If you eat at fast-food restaurants, knowing the nutritional content of various items can help you make better choices. Fast-food restaurants provide nutritional information both online and in print brochures available at most restaurant locations. To learn more about the items you order, visit the restaurants’ websites. Here are some popular fast-food restaurants and their web addresses:

Arby’s	http://www.arbys.com
Burger King	http://www.bk.com/en/us/index.html
Chipotle	http://www.chipotle.com
Domino’s Pizza	http://www.dominos.com
Hardees	http://www.hardees.com
Jack in the Box	http://www.jackinthebox.com
KFC	http://www.kfc.com
McDonald’s	http://www.mcdonalds.com
Starbucks	http://www.starbucks.com
Subway	http://www.subway.com
Taco Bell	http://www.tacobell.com
Wendy’s	http://www.wendys.com
White Castle	http://www.whitecastle.com

[Click here to view a larger image of the Healthy Eating Plate](#)

HEALTHY EATING PLATE



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The Nutrition Source
www.hsph.harvard.edu/nutritionsource

Harvard Medical School
Harvard Health Publications
www.health.harvard.edu



A SELF-CARE GUIDE FOR COMMON MEDICAL PROBLEMS

B

This self-care guide will help you manage some of the most common symptoms and medical problems, including the following:

- Fever.
- Sore throat.
- Cough.
- Nasal congestion.
- Ear problems.
- Nausea, vomiting, or diarrhea.
- Heartburn and indigestion.
- Headache.
- Low-back pain.
- Strains and sprains.
- Cuts and scrapes.

The following sections describe symptoms in terms of what is going on in your body. Most symptoms are part of the body's natural healing response. Symptoms are usually self-limiting; that is, they resolve on their own with time and simple self-care.

This appendix also offers basic self-care advice, along with guidelines for getting professional help. No medical advice is perfect. You must decide whether to self-treat or get professional help. This guide is intended to give you information so you can make better, more informed decisions. If the advice given here differs from that of your physician, follow your physician's instructions because they will be based on your condition, health status, medical history, and other factors that apply specifically to you.

The guidelines given here apply to *generally healthy adults*. If you are pregnant or nursing or if you have a chronic disease, particularly one that requires medication, check with your physician for appropriate self-care advice. Additionally, if you have an allergy or suspected allergy to any recommended medication—including over-the-counter (OTC) medicines—check with your physician before using it.

If you have several symptoms, read about your primary symptom first and then proceed to secondary symptoms. If you are particularly concerned about a symptom or confused about how to manage it, call your physician to get more information.

FEVER

A *fever* is an abnormally high body temperature, usually over 100°F (37.7°C). It is most commonly a sign that your body is fighting an infection. Fever may also be due to an inflammation, an injury, or a drug reaction. Chemicals released into your bloodstream during an infection reset the thermostat in your brain. The message goes out to your body to turn up the heat. The blood vessels in your skin constrict, and you curl up and throw on extra blankets to reduce heat loss. Meanwhile, your muscles may begin to shiver to generate additional body heat. The resulting rise in body temperature is a fever. Later, when your brain senses that the temperature is too high, you start sweating. As the sweat evaporates, it carries heat away from the body.

A fever may help you fight infections by making the body less hospitable to bacteria and viruses. A high body temperature appears to bolster the immune system and may inhibit the growth of infectious microorganisms.

Most generally healthy people can tolerate a fever as high as 103–104°F (39.5–40°C) without problems. If you are essentially healthy, there is little need to reduce a fever unless you are very uncomfortable. Older adults and people with chronic health problems such as heart disease may not tolerate a high fever, however, so fever reduction may be advised.

In small children (especially infants), even a low-grade fever can be a sign of a serious problem. Seek immediate medical help for any infant younger than 3 months whose temperature is 100.4°F (38°C) or higher, or for any child older than 3 months whose temperature is greater than 102°F (38.8°C). In small children, temperature should be checked with a digital rectal thermometer. Do not attempt to take a baby's temperature orally; if you have trouble taking a child's temperature for any reason, contact a medical professional right away.

Most problems with fevers are due to loss of fluids from evaporation and sweating, which may cause dehydration.

Self-Assessment

1. If you are sick, take your temperature several times throughout the day. Oral temperatures should not be measured for at least 10 minutes after smoking, eating, or drinking a hot or cold liquid. Don't use a glass thermometer that contains mercury. Digital thermometers are accurate, easy to read, and inexpensive. Follow your thermometer's directions.

"Normal" temperature varies from person to person, so it is important to know what is normal for you. Your normal temperature will also vary throughout the day, being lowest in the early evening. If you exercise or if it is a hot day, your temperature may normally rise. Women's body temperatures typically vary by a degree or more through the menstrual cycle, peaking around the time of ovulation. Rectal temperatures normally run about 0.5–1.0°F higher than oral temperatures.

If your recorded temperature is more than 1.0–1.5°F above your normal baseline temperature, you have a fever.

2. If you have a fever, watch for signs of dehydration. They include excessive thirst; very dry mouth; infrequent urination with dark, concentrated urine; and light-headedness.

Self-Care

1. Drink plenty of fluids to prevent dehydration—at least eight ounces of water, juice, or broth every two hours.

2. Take a sponge bath using lukewarm water to increase evaporation and help reduce body temperature naturally. Don't use alcohol rubs to reduce temperature.
3. Dress lightly. Bundling up interferes with the body's ability to shed excess heat.
4. Take an aspirin substitute (acetaminophen, ibuprofen, or naproxen sodium) to reduce the fever and the associated headache and achiness. Follow the product's dosage instructions carefully. Do not give aspirin to anyone younger than age 20 because some younger people with chicken pox, influenza, or other viral infections can develop a life-threatening complication, called Reye's syndrome, after taking aspirin.

When to Call the Physician

- If the fever is higher than 103°F (39.5°C), or higher than 102°F (38.8°C) in a person over 60 years old.
- If a fever lasts more than three days.
- If you experience recurrent unexplained fevers.
- If a fever is accompanied by a rash, stiff neck, severe headache, difficulty breathing, discolored sputum, severe pain in the side or abdomen, painful urination, convulsions, or confusion.
- If you show signs of dehydration along with a fever.
- If a fever appears after starting a new medication.

SORE THROAT

A sore throat—called *pharyngitis*—is caused by inflammation of the throat lining resulting from an infection, allergy, or irritation (especially from cigarette smoke). If you have an infection, you may also notice some hoarseness from swelling of the vocal cords and “swollen glands,” which are enlarged lymph nodes that produce white blood cells to help fight the infection. Lymph nodes may become tender and remain swollen for weeks after the infection subsides.

Viruses cause most throat infections, so antibiotics are not effective against them. Most viral sore throats clear up in about a week with no treatment. But if a sore throat is accompanied by other symptoms (like a high fever, fatigue, aches, rash, or localized swelling), a more serious viral illness is possible, such as the flu, mononucleosis, or measles. These conditions should be diagnosed and treated by a physician.

About 20–30% of throat infections (called “strep throat”) are due to streptococcal bacteria. This type of microbe can cause complications such as rheumatic fever and rheumatic heart disease, and therefore should be diagnosed by a physician and treated with antibiotics. Strep throat is usually characterized by a very sore throat, a high fever, swollen lymph nodes, and a whitish discharge at the back of the throat.

Allergy-related sore throats may come with a runny nose, sneezing, and watery, itchy eyes.

Self-Assessment

1. Take your temperature.
2. Look at the back of your throat in a mirror. Is there a whitish discharge on the tonsils or in the back of the throat?
3. Feel the front and back of your neck. Do you feel enlarged, tender lymph nodes?

Self-Care

1. If you smoke, stop.
2. Drink plenty of liquids to soothe your inflamed throat.
3. Gargle with warm salt water (¼ tsp salt in 4 oz water) every hour or so to help reduce swelling and discomfort.
4. Suck on throat lozenges, cough drops, or hard candies to keep your throat moist.
5. Use throat lozenges, sprays, or gargles that contain an anesthetic to make swallowing less painful.
6. Try an aspirin substitute to ease throat pain.
7. For an allergy-related sore throat, try an antihistamine such as chlorpheniramine or loratadine.

When to Call the Physician

- If you have great difficulty swallowing saliva or breathing.
- If your sore throat is accompanied by a fever over 101°F (38.3°C), especially if you do not have other cold symptoms such as nasal congestion or a cough.
- If your sore throat is accompanied by a skin rash.
- If whitish pus appears on the tonsils.
- If you have a sore throat and recently had contact with a person who has had a positive throat culture for strep.
- If your lymph nodes have been enlarged for more than three weeks.
- If you have been hoarse for more than three weeks.

COUGH

A *cough* is a protective mechanism of the body to help keep the airways clear. There are two types of cough: a dry cough (without mucus) and a productive cough (with mucus). Common causes of cough include infection (viral or bacterial), allergies, and irritation from smoking and pollutants. If you have a cold, the cough may be the last symptom to improve because the airways may remain irritated for several weeks after the infection has resolved.

Your airways are lined with hairlike projections called *cilia*, which move back and forth to help clear the airways of mucus, germs, and dust. Infections and cigarette smoking paralyze and damage this vital defensive mechanism.

Self-Assessment

1. Take your temperature.
2. Observe your mucus. Thick brown or bloody mucus suggests a bacterial infection.

Self-Care

1. If you smoke, stop.
2. Drink plenty of liquids (at least six eight-ounce glasses a day) to help thin mucus and loosen chest congestion.
3. Use moist heat from a hot shower or vaporizer to help loosen chest congestion.
4. Suck on cough drops, throat lozenges, or hard candy to moisten your throat and relieve a dry, tickling cough.

5. If you have a dry, nonproductive cough or the cough keeps you from sleeping, you can use a cough syrup or lozenge that contains the nonprescription cough suppressant dextromethorphan. If your cough is productive, ask your physician before using a cough suppressant. Productive coughs are often protective.

When to Call the Physician

- If your cough is accompanied by thick brown or bloody sputum.
- If your cough is accompanied by a high fever—above 102°F (38.8°C)—and shaking chills.
- If you are experiencing severe chest pains, wheezing, or shortness of breath.
- If your cough lasts longer than three weeks (a chronic cough).

NASAL CONGESTION

Nasal congestion (a stuffy nose) is most commonly caused by infection or allergies. When infected, the nasal passages become congested because of increased blood flow and mucus production. This congestion is actually part of the body's defense to fight infection. The increased blood flow raises the temperature of the nasal passages, making them less hospitable to germs. The nasal secretions are rich in white blood cells and antibodies to help fight and neutralize the invading organisms and flush them away. Nasal congestion associated with sore throat, cough, and fever usually indicates a viral infection. Green nasal discharge is common with viral infections; it does not mean you need an antibiotic.

Nasal congestion caused by allergies is often accompanied by a thin watery discharge, sneezing, and itchy eyes; it is sometimes associated with a seasonal pattern. In an allergic reaction, the offending allergen (such as pollen, dust, mold, or dander) triggers the release of histamine and other chemicals from the cells lining the nose, throat, and eyes. These chemicals cause swelling, discharge, and itching. Antihistamine drugs block the release of these irritating chemicals.

Self-Assessment

1. Take your temperature.
2. Observe your nasal secretions. Thick brown or bloody discharge suggests a bacterial infection.
3. Tap with your fingers over the sinus cavities above and below the eyes. If the tapping causes increased pain, you may have a bacterial sinus infection.

Self-Care

1. If you smoke, stop.
2. Use moist heat from a hot shower or vaporizer to help liquefy congested mucus.
3. Use a decongestant nasal spray or drops to temporarily relieve congestion. However, if these decongestants are used for more than three days, they can cause "rebound congestion" that actually creates more nasal congestion. As an alternative, use saltwater nose drops (¼ tsp salt in ½ cup boiled water, cooled before using) or a commercial saline spray several times a day.

4. Try an oral decongestant such as pseudoephedrine (60 mg every six hours) to help shrink swollen mucous membranes and open nasal passages. In some people, these medications can cause nervousness, sleeplessness, or heart palpitations. If you have uncontrolled high blood pressure, heart disease, or diabetes, check with your physician before using decongestants.

When to Call the Physician

- If nasal congestion is accompanied by severe pain and tenderness in the forehead, cheeks, or upper teeth and a high fever (above 102°F or 38.8°C).
- If you have thick brown or bloody nasal discharge.
- If your nasal congestion and discharge are unresponsive to self-care and last longer than three weeks.

EAR PROBLEMS

Ear symptoms include earache, discharge, itching, stuffiness, and hearing loss. They may be caused by problems in the external ear canal, eardrum, middle ear, or eustachian tube (the passage that connects the middle ear space to the back of the throat). The ear canal can become blocked by excess wax, producing hearing loss and a sense that the ear is plugged. An infection of the external ear canal due to excessive moisture and trauma is often referred to as "swimmer's ear." It can cause pain, a sense of fullness, discharge, and itching. Congestion and blockage of the eustachian tube by a cold or allergy can result in pain, a sense of fullness, and hearing loss. A middle ear infection often produces severe pain, hearing loss, and fever.

Self-Assessment

1. Check for fever, which may be a sign of infection.
2. Have someone look into the ear canal with a flashlight. Look for wax blockage or a red, swollen canal indicating an external ear infection.
3. Wiggle the outer part of the ear. If this increases the pain, an infection or inflammation of the external ear canal is the likely cause.

Self-Care

1. If blockage of the ear canal with wax is the problem, first try a hot shower to liquefy the wax, and use a wash cloth to wipe out the ear canal. You can also use a few drops of an over-the-counter wax softener and then flush the canal gently with warm water in a bulb syringe. Do not use sharp objects or cotton swabs; they can scratch the ear canal or push the wax in deeper.
2. To treat mild infections of the external ear canal, you must thoroughly dry the ear canal. A few drops of a drying solution (one part rubbing alcohol, one part white vinegar) on a piece of cotton gently inserted into the ear canal can act as a wick to dry the canal.
3. To relieve congestion and blockage of the eustachian tube, try a decongestant like pseudoephedrine or a nasal spray (but for no longer than three days). Hot showers or a vaporizer may help loosen secretions, and yawning or swallowing may help

open the eustachian tube. For a mild plugging sensation without fever or pain, pinch your nostrils and blow gently into your nose (not through your mouth) to force air up the eustachian tube and “pop” your ears.

When to Call the Physician

- If you have a severe earache accompanied by a fever.
- If puslike or bloody discharge comes from the ear.
- If you experience sudden hearing loss, especially if accompanied by ear pain or recent trauma to the ear.
- If you have ringing in the ears or dizziness.
- If you experience any ear symptom that lasts longer than two weeks.

NAUSEA, VOMITING, OR DIARRHEA

Nausea, vomiting, and diarrhea usually are defensive reactions of your body to rapidly clear your digestive tract of irritants. These symptoms may be caused by a viral infection, foodborne illness, medications, or other types of infection. Vomiting dramatically ejects irritants from your stomach, and nausea (feeling discomfort in the stomach or the sensation that you may vomit) discourages eating to allow the stomach to rest. With diarrhea, overstimulated intestines flush out the offending irritants.

The major complications of vomiting and diarrhea are dehydration from fluid loss and decreased fluid intake and a risk of bleeding from irritation of the digestive tract.

Self-Assessment

1. Take your temperature. A fever is often a clue that an infection is causing the symptoms.
2. Note the color and frequency of vomiting and diarrhea. This will help you estimate the severity of fluid losses and check for bleeding (red, black, or “coffee grounds” material in the stool or vomit; iron tablets and Pepto-Bismol can also cause black stools).
3. Watch for signs of dehydration. They include a very dry mouth; excessive thirst; infrequent urination with dark, concentrated urine; and light-headedness.
4. Look for signs of hepatitis, an infection of the liver. Symptoms include a yellow color in the skin and the white parts of the eyes.

Self-Care

1. To replace fluids, take frequent, small sips of clear liquids such as water, noncitrus juice, broths, flat ginger ale, or ice chips.
2. When the vomiting and diarrhea have subsided for at least six hours, try nonirritating, constipating foods like the BRAT diet: bananas, rice, applesauce, and toast.
3. For several days, avoid alcohol, milk products, fatty foods, aspirin, and other medications that might irritate the stomach. Do not stop taking regularly prescribed medications without discussing this change with your physician.
4. Medications are not usually advised for vomiting. Loperamide, available without a prescription, can ease diarrhea.

When to Call the Physician

- If you cannot retain any fluids for 12 hours or show signs of dehydration.
- If you have severe abdominal pains that are not relieved by the vomiting or diarrhea.
- If you see blood in the vomit (red or “coffee grounds” material) or in the stool (red or black tarlike material).
- If the vomiting or diarrhea is accompanied by a high fever (above 102°F or 38.8°C).
- If you see a yellow coloring of the skin or the white parts of the eyes.
- If your vomiting is accompanied by a severe headache or if you have experienced a recent head injury.
- If vomiting or diarrhea lasts three days without improvement.
- If you are pregnant or have diabetes.
- If you experience recurrent vomiting and/or diarrhea.

HEARTBURN AND INDIGESTION

Indigestion and heartburn are usually a result of irritation of the stomach or the *esophagus* (the tube that connects the mouth to the stomach). The stomach lining is usually protected from stomach acids, but the esophagus is not. Therefore, if stomach acids “reflux,” or back up into the esophagus, the result is usually a burning discomfort in the chest and throat. The esophagus is normally protected by a muscular valve—called a *sphincter*—that allows food to enter the stomach but prevents stomach contents from flowing upward into the esophagus. Certain foods (including chocolate, garlic, and onions), medications, and smoking can loosen and open this protective valve. Overeating, lying down, or bending over can also cause the stomach acids to gain access to the sensitive lining of the esophagus.

Self-Assessment

1. Look for a pattern in the symptoms. Do they occur after eating certain foods, taking certain medications, or when you bend over or lie down? Do certain foods or an antacid relieve the symptoms?
2. Observe your bowel movements. Black tarlike stools may indicate bleeding in the stomach (iron tablets and Pepto-Bismol can also cause black stools).

Self-Care

1. Avoid irritants such as smoking, aspirin, ibuprofen, naproxen sodium, alcohol, caffeine (coffee, tea, cola), chocolate, onions, carbonated beverages, spicy or fatty foods, acidic foods (vinegar, citrus fruits, tomatoes), or any other foods that seem to make your symptoms worse.
2. Take nonabsorbable antacids such as Maalox, Mylanta, or Gelusil every hour or two and especially before bedtime, or try an acid reducer, now available without a prescription (Pepcid, Tagamet, Zantac, or Prilosec). These drugs work in different ways, so ask your physician to help you choose the right medication for you.

3. Avoid tight clothing.
4. Avoid overeating. Eat smaller, more frequent meals.
5. Don't lie down for one or two hours after a meal. Elevate the head of your bed with 4- to 6-inch blocks of wood or bricks. Adding extra pillows usually makes things worse by creating a posture that increases pressure on the stomach. Try sleeping on your left side, which may reduce reflux compared to sleeping on your back or right side.
6. If you are overweight in the abdominal area, weight loss may help. Abdominal obesity can increase pressure on the stomach when you are lying down.

When to Call the Physician

- If you produce stools that are black and tarlike or vomit that is bloody or contains material that looks like coffee grounds.
- If you suffer severe abdominal or chest pain.
- If you have pain that goes through to the back.
- If you get no relief from antacids.
- If you have trouble swallowing solid foods.
- If your symptoms last longer than three days.

Recurrent or persistent abdominal pain may be a symptom of an ulcer, a raw area in the lining of the stomach or *duodenum* (the first part of the small intestine). About 1 in 5 men and 1 in 10 women develop an ulcer at some time in their lives. Most ulcers are linked to infection with the bacterium *Helicobacter pylori*; people who regularly take nonsteroidal anti-inflammatory drugs like aspirin or ibuprofen are also at risk for ulcers because these drugs irritate the lining of the stomach. *H. pylori* infection is relatively easy to diagnose and treat, and other medications are available to treat ulcers linked to other causes. Many of the self-care measures described here are also frequently recommended for people with ulcers.

HEADACHE

Headache is one of the most common symptoms. There are four major types of headache: tension, migraine, cluster, and sinus. Tension headaches, migraines, and cluster headaches are described in Chapter 2. Sinus headaches are caused by blockage of the sinus cavities with resulting pressure and pain in the cheeks, forehead, and upper teeth. Headache caused by elevated blood pressure is uncommon and occurs only at very high pressure levels.

Self-Assessment

1. Take your temperature. The presence of fever may indicate a sinus infection. Fever, severe headache, and a very stiff neck suggest *meningitis*—a rare but extremely serious infection around the brain and spinal cord.
2. Tap with your fingers over the sinus cavities in your cheeks and forehead. If this causes increased pain, it may indicate a sinus infection.
3. For recurrent headaches, keep a headache journal. Record how often and when your headaches occur, associated symptoms,

activities that precede the headache, and your food and beverage intake. Look for patterns that may provide clues to the cause(s) of your headaches.

Self-Care

1. Try applying ice packs or heat on your neck and head.
2. Gently massage the muscles of your neck and scalp.
3. Try deep relaxation or breathing exercises.
4. Take aspirin or an aspirin substitute for pain relief. Over-the-counter products containing a combination of aspirin, acetaminophen, and caffeine are approved by the FDA for treating migraines.
5. If the pain is associated with nasal congestion, try a decongestant medication like pseudoephedrine.
6. Try to avoid emotional and physical stressors (such as poor posture and eyestrain).
7. Try avoiding foods that may trigger headaches, such as aged cheeses, chocolate, nuts, red wine, alcohol, avocados, figs, raisins, and fermented or pickled foods.

When to Call the Physician

- If you experience a headache that seems unusually severe or occurs suddenly.
- If your headache is accompanied by fever and a very stiff neck.
- If your headache occurs along with sinus pain, tenderness, and fever.
- If you get a severe headache following a recent head injury.
- If your headache is associated with slurred speech, visual disturbance, or numbness or weakness in the face, arms, or legs.
- If a headache persists longer than three days.
- If you get recurrent unexplained headaches.
- If your headaches increase in severity or frequency.
- If you experience severe migraine headaches.

LOW-BACK PAIN

Pain in the lower back is a very common condition; it is most often due to a strain of the muscles and ligaments along the spine, often triggered by bending, lifting, or other activity. Low-back pain can also result from bone growths (spurs) irritating the nerves along the spine or pressure from ruptured or protruding discs, which are the “shock absorbers” between the vertebrae. Sometimes back pain is caused by an infection or stone in the kidney. Fortunately, however, simple muscular strain is the most common cause of low-back pain and can usually be effectively self-treated.

Self-Assessment

1. Take your temperature. Back pain with high fever may indicate a kidney or other infection.
2. Check for blood in your urine or frequent, painful urination, which may also indicate a kidney problem.
3. Observe for tingling or pain traveling down one or both legs below the knee when you bend, cough, or sneeze. These symptoms suggest a disc problem.

Self-Care

1. Lie on your back or in any comfortable position on the floor or a firm mattress, with knees slightly bent and supported by a pillow. Rest for a day if the pain persists.
2. Use ice packs on the painful area for the first three days, and then continue with cold or change to heat, whichever gives more relief.
3. Take aspirin or an aspirin substitute for pain relief.
4. After the acute pain has subsided, begin gentle back and stomach exercises. Practice good posture and lifting techniques to protect your back. Try to resume gentle, everyday activities like walking as soon as possible. Bed rest beyond one day is no longer advised and may make things worse; try gentle stretching and resume activities that don't aggravate the problem. To learn more about proper back exercises and use of your back, consult a physical therapist or your physician.

When to Call the Physician

- When your back pain follows a severe injury such as a car crash or fall.
- If the pain radiates down the leg *below* the knee on one or both sides.
- If you experience persistent numbness, tingling, or weakness in the legs or feet.
- If you experience a loss of bladder or bowel control.
- If your back pain is associated with high fever (above 101°F or 38.3°C), frequent or painful urination, blood in the urine, or severe abdominal pain.
- If the pain does not improve after 72 hours of self-care.

STRAINS AND SPRAINS

Missteps, slips, falls, and athletic misadventures can result in a variety of strains, sprains, and fractures. A *strain* occurs when you overstretch a muscle or tendon (the connective tissue that attaches muscle to bone). *Sprains* are caused by overstretching or tearing ligaments (the tough fibrous bands that connect bone to bone). A *fracture* is a break in a bone, which may or may not go all the way through the bone. Depending on the severity and location, a sprain may actually be more serious than a fracture because bones generally heal very strongly, whereas ligaments may remain stretched and lax after healing. After a sprain, it may take six weeks for the ligament to heal.

After most injuries, you can expect pain and swelling. This is the body's way of immobilizing and protecting the injured part so that healing can take place. The goal of self-assessment is to determine whether you have a minor injury that you can safely self-treat or a more serious injury to an artery, nerve, or bone that should be treated by your physician.

Self-Assessment

1. Watch for coldness, blue color, or numbness in the limb beyond the injury. These may be signs of damage to an artery or a nerve.

2. Look for signs of a possible fracture, which include a misshapen limb, reduced length of the limb on the injured side compared to the uninjured side, an inability to move or bear weight, a grating sound with movement of the injured area, extreme tenderness at one point along the injured bone as you press with your fingers, or a sensation of snapping at the time of the injury.
3. Gently move the injured area through its full range of motion. Immobility or instability suggests a more serious injury.

Self-Care

1. Immediately immobilize, protect, and rest the injured area until you can bear weight on it or move it without pain. Remember: If it hurts, don't do it.
2. To decrease pain and swelling, immediately apply ice (a cold pack or ice wrapped in a cloth) for 15 minutes every hour for the first 24–48 hours. Then apply ice or heat as needed for comfort.
3. Immediately elevate the injured limb above the level of your heart for the first 24 hours to decrease swelling.
4. Immobilize and support the injured area with an elastic wrap or splint. Be careful not to wrap so tightly as to cause blueness, coldness, or numbness.
5. Take aspirin or an aspirin substitute for pain as needed.

When to Call the Physician

- If the injury occurred with great force, such as a high fall or a motor vehicle crash.
- If you hear or feel a snap at the time of the injury.
- When the injured limb is blue, cold, or numb.
- When the limb is bent, twisted, or crooked.
- If you feel tenderness at specific points along a bone.
- If you cannot move the injured area.
- If a joint becomes wobbly or unstable.
- If there is marked swelling of the injured area.
- If the injured area cannot bear weight after 24 hours.
- If you experience pain that increases or lasts longer than four days.

CUTS AND SCRAPES

Cuts and scrapes are common disruptions of the body's skin. Fortunately the vast majority of these wounds are minor and don't require stitches, antibiotics, or a physician's care. An *abrasion* involves a scraping away of the superficial layers of skin. Abrasions, though less serious than cuts, are often more painful because they disrupt more skin nerves. There are two types of cuts: *lacerations* (narrow slices of the skin) and *puncture wounds* (stabs into deeper tissues).

Normal healing of a cut or abrasion is a remarkable process. After the bleeding stops, small amounts of serum, a clear yellowish fluid, may leak from the wound. This fluid is rich in antibodies to help prevent an infection. Redness and swelling may normally occur as more blood is shunted to the area, bringing white blood cells and nutrients to speed healing. There may also be some swelling of nearby lymph nodes, which are another part of your body's defense

against infection. Finally, a scab forms. This is “nature’s bandage,” which protects the area while it heals.

The main concerns about cuts are the possibility of damage to deeper tissues and the risk of infection. Damage to underlying blood vessels may lead to severe bleeding as well as blueness and coldness in areas beyond the wound. Injured nerves may produce numbness and a loss of the ability to move parts of the body beyond the injured area. Damaged muscles, tendons, and ligaments can also result in inability to move areas beyond the cut.

Wound infection usually does not take place until 24–48 hours after an injury. Signs of infection include increasing redness, swelling, pain, pus, and fever. One of the most serious, though fortunately uncommon, complications of puncture wounds is tetanus (“lockjaw”). This bacterial infection thrives in areas not exposed to oxygen, so it is more likely to develop in deep puncture wounds or dirty wounds. Tetanus is not likely to develop in minor cuts or wounds caused by clean objects like knives. You need a tetanus immunization shot following a cut under the following conditions:

- If you have never had the recommended tetanus immunization injections.
- If you have a dirty or contaminated wound and it has been longer than five years since your last tetanus immunization.
- If you have a clean, minor wound and it has been longer than 10 years since your last tetanus immunization.

Self-Assessment

1. Look for warning signs of complications: persistent bleeding, numbness, an inability to move the injured area, or the later development of pus, increasing redness, and fever.
2. Measure the cut. If your cut is shallow, less than ¼ inch deep, less than an inch long, and not in a high-stress area (such as a joint, which bends) and you can easily hold the edges of the wound closed, it probably won’t need stitches.

Self-Care

1. Apply direct pressure over the wound until the bleeding stops. The only exception is puncture wounds, which should be encouraged to bleed freely (unless spurting a large amount of blood) for a few minutes to flush out bacteria and debris.

2. When bleeding stops, wash your hands thoroughly with soap and water, then carefully cleanse the wound with clean water. Avoid getting soap in the wound because it can irritate exposed tissues. Experts now advise against pouring hydrogen peroxide into a wound because it may damage sensitive tissue. Do not try to remove visible dirt, debris, or objects (such as splinters or shards) from the wound; such cleaning should be done by a medical professional. If you don’t see anything in the wound but suspect something may be there, see a doctor immediately.
3. Pat the area dry with a clean towel, then apply an antiseptic ointment and a clean bandage.
4. If it is an abrasion, cover the area with a sterile adhesive bandage until a scab forms. For minor lacerations, close the cut with a butterfly bandage or a sterile adhesive tape, drawing the edges close together but not overlapping. If there is an extra flap of clean skin, leave it in place for extra protection. Do not attempt to close a puncture wound. Instead soak the wound in warm water for 15 minutes several times a day for several days. Soaking helps keep the wound open and thus prevents infection.

When to Call the Physician

- If you cannot control bleeding by applying direct pressure to the wound.
- If you develop numbness, weakness, or an inability to move the injured area.
- If the wound (any wound) is large or deep.
- If you get a cut in an area that bends and with edges that cannot easily be held together.
- If you are cut on the hands or face, unless the injury is clean and shallow.
- If the wound is contaminated and you cannot remove the foreign material.
- If the injury was caused by a human or animal bite.
- If you need a tetanus immunization (see the indications noted earlier).
- If the wound develops increasing redness, swelling, pain, pus, or fever 24 hours or more after the injury.
- If the wound is not healing well after three weeks.

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A smiling woman with curly hair, wearing a blue and white striped shirt and a denim vest, holds a red apple. She is standing in front of a wooden fruit stand filled with various fruits like lemons, limes, and apples. The background is slightly blurred, focusing on the woman and the fruit stand.

CORE CONCEPTS IN HEALTH

THIRTEENTH EDITION

Paul M. Insel

Stanford University

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CONNECT CORE CONCEPTS IN HEALTH, LOOSE-LEAF EDITION, THIRTEEN

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Connect Core Concepts in Health gives students access to a wealth of interactive online content, including fitness labs and self-assessments, video activities, a fitness and nutrition journal, a behavior change workbook, and practice quizzes with immediate feedback. Additionally, the media-rich eBook available with Connect Plus contains embedded video clips, full-color images, links to discipline-specific sites, key terms and definitions, and behavior change tools.

Chapter by Chapter

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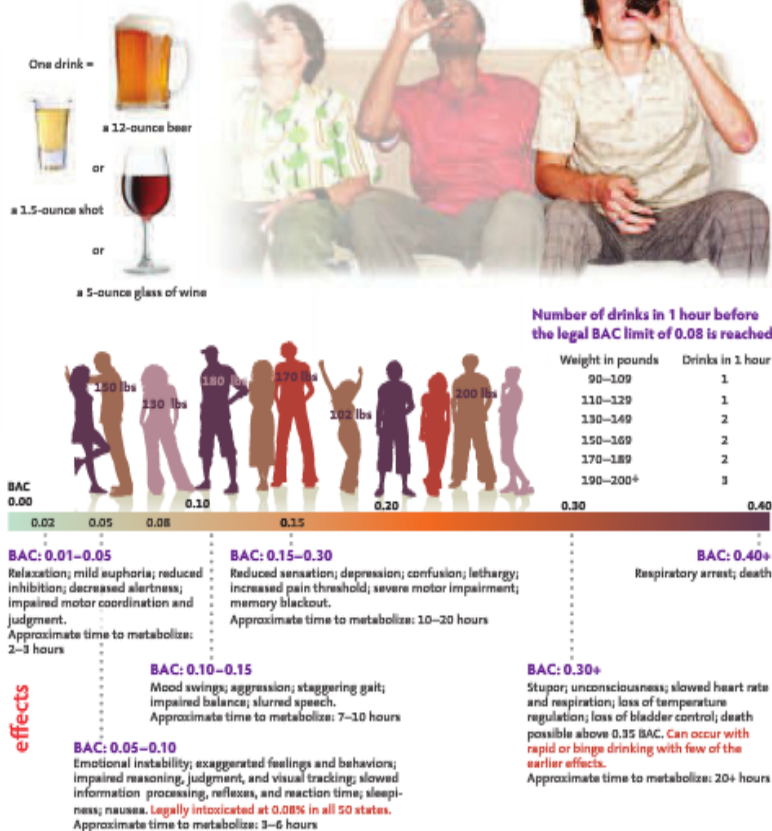
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Suggested Assignments by Chapter
These assignments have been created to support the learning objectives of your course

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Blood alcohol concentration (BAC) rises quickly with alcohol consumption, but alcohol is metabolized at a relatively slow rate—about 1 drink per hour. Note that rate of alcohol metabolism varies widely depending on sex, body weight, ethnicity, age, food in the stomach, genetics, and other factors—so the effects at different BACs also vary.



Connect Core Concepts in Health supports student learning with a wealth of print and online features. In addition to the rich set of resources available in Connect, feature boxes in the text highlight issues related to diversity, behavior change, and consumer awareness. The 13th edition features two vibrant transparency sections called “Touring Lifestyle Behaviors” and “Touring the Cardiorespiratory System” designed to engage students and reinforce learning, especially for visual learners.

THE CORE CONCEPTS IN HEALTH LEARNING SYSTEMS

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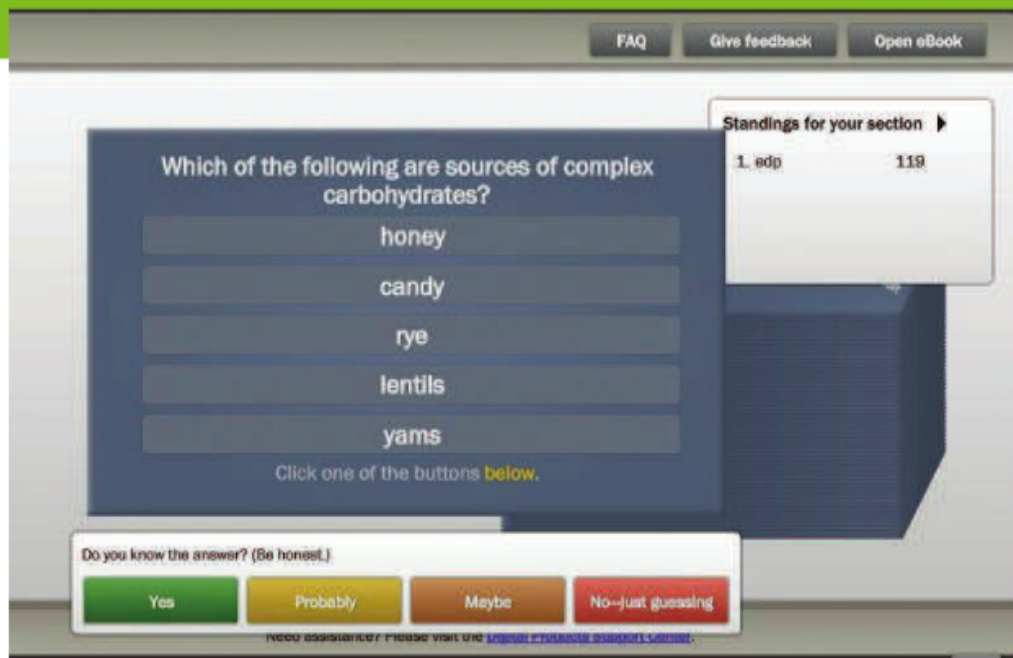
Connect Core Concepts in Health is an integrated program designed to personalize the science of personal health and to motivate students to build research skills, critical thinking skills, and behavior change skills for lifelong health. The new edition of *Connect Core Concepts in Health* combines the expert content you've come to expect with an increased focus on behavior change and personalization—personal learning styles, personal motivation, and personal responsibility. Highlights of the 13th edition include

- The LearnSmart adaptive testing program, which creates individualized study plans for each student, helping to build a strong foundation of knowledge.
- The latest scientific findings, data, and statistics, with up-to-date coverage of topics ranging from the government's MyPlate food guidance system to the potential positive and negative effects of digital communication technologies to the latest physical activity recommendations.
- A new "Wellness on Campus" feature in every chapter that explores specific health and wellness issues as they pertain to college students.
- A new media bank in Connect, offering easy access to all of the video content available with *Connect Core Concepts in Health*.



A PERSONAL PLAN FOR LEARNING

McGraw-Hill's LearnSmart is an adaptive learning system designed to help students learn faster, study more efficiently, and retain knowledge for greater success. Through a series of adaptive questions, LearnSmart continually measures and monitors each student's progress. LearnSmart provides each student with a unique, individualized learning path to help him or her increase knowledge and competencies while helping to make class time more interactive and productive.



WELLNESS ON CAMPUS Deliberate Self-Harm

In general, people want to be well and healthy, protect themselves from harm, and try to make use of the guidance that this book gives. But surprisingly, there are individuals—predominantly in their teens and adolescence—who deliberately harm themselves, although in a nonfatal way. One common method is to cut or burn their skin, leaving scars that may serve as visible representation of emotional pain that they shamefully hide beneath their clothes.

Self-cutting and other self-injurious behaviors are not aesthetically motivated. Many report seeking the physical sensations (including pain) produced by a self-inflicted injury, which may temporarily relieve feelings of tension, perhaps through a release of endorphins.

In 2011 a research group led by Alicia Maurer, an associate professor of psychology at Southern Methodist University, conducted surveys on more than 550 college students and found that over 20% had engaged in self-injury at some point, which is consistent with prevalence estimates in other studies on college populations. In examining differences between self-injurers and non-injurers, individuals that had recently engaged in self-harm were significantly more depressed, anxious, and disgusted with themselves. Compared to non-injurers, self-injurers were roughly 4 times more likely to report a history of physical abuse and 11 times more likely to report a history of sexual abuse.



Self-injury is not the same as a suicide attempt, but individuals who repeatedly hurt themselves are more likely to commit suicide than the general population. In any case, self-injury should be taken seriously. If you do it, talk to a counselor. If someone you know does it, try to convince him or her to talk to a counselor.

NEW "Wellness on Campus" features highlight health and wellness issues that are of particular relevance to college students. Topics include alcoholic energy drinks, eating well while on campus, and protecting against STDs.

A PERSONAL APPROACH TO BEHAVIOR CHANGE

An extensive program of Wellness Worksheets help students to evaluate and assess their own health-related behaviors, and to chart their progress in meeting personal health goals. These Wellness Worksheets are available online, where they can be assigned, submitted, and stored electronically.



Wellness Worksheet 93 Diet and Cancer

All the information you enter in this exercise will be saved when you exit.

Your diet may include both cancer fighters and cancer promoters. Track your diet for 3 days and select which day you ate any food on one of the following lists.

Potential Cancer Fighters				Day1	Day2	Day3	
Orange and yellow vegetables and (some) fruits							whole grains (whole-grain bread, cereal, and pasta; brown rice; etc.)
Day1	Day2	Day3					legumes (peas, lentils, and beans, including fava, navy, kidney, pinto, black, and lima beans)
☐	☐	☐	apricots	☐	☐	☐	apples
☐	☐	☐	cantaloupe	☐	☐	☐	asparagus
☐	☐	☐	carrots	☐	☐	☐	berries (strawberries, raspberries, blueberries)
☐	☐	☐	mangoes	☐	☐	☐	chili peppers
☐	☐	☐	papaya	☐	☐	☐	grapes
☐	☐	☐	pumpkin	☐	☐	☐	green peppers
☐	☐	☐	red and yellow peppers	☐	☐	☐	honeydew melon
☐	☐	☐	sweet potatoes (yams)	☐	☐	☐	kiwi fruit
☐	☐	☐	winter squash (acorn, butternut, banana, etc.)	☐	☐	☐	onions, garlic, leeks
☐	☐	☐	other:	☐	☐	☐	radishes
Dark-green leafy vegetables				☐	☐	☐	soy products (tofu, tempeh, soy milk, miso, soybeans, etc.)
Day1	Day2	Day3		☐	☐	☐	sprouts (alfalfa, broccoli)
☐	☐	☐	beet greens	☐	☐	☐	tomatoes
☐	☐	☐	broccoli rabe	☐	☐	☐	watermelon
☐	☐	☐	chard	☐	☐	☐	other:
☐	☐	☐	collard greens	☐	☐	☐	



TAKE CHARGE

Realistic Self-Talk

Do your patterns of thinking make events seem worse than they truly are? Do negative beliefs about yourself become self-fulfilling prophecies? Substituting realistic self-talk for negative self-talk can help you build and maintain self-esteem and cope better with the challenges in your life. Here are some examples of common types of distorted, negative self-talk, along with suggestions for more accurate and rational responses.

COGNITIVE DISTORTION	NEGATIVE SELF-TALK	REALISTIC SELF-TALK
Focusing on negatives	Babysitting is such a pain in the neck; I wish I didn't need the extra money so bad.	This is a tough job, but at least the money's decent and I can study once the kids go to bed.
Expecting the worst	I know I'm going to get an F in this course. I should just drop out of school now.	I'm not doing too well in this course. I should talk to my professor to see what kind of help I can get.
Overgeneralizing	My hair is a mess and I'm gaining weight. I'm so ugly. No one would ever want to date me.	I could use a haircut and should try to exercise more. This way I'll start feeling better about myself and will be more confident when I meet people.
Minimizing	It was nice of everyone to eat the dinner I cooked, even though I ruined it. I'm such a rotten cook.	Well, the roast was a little dry but they ate every bite. The veggies and rolls made up for it. I'm finally getting the hang of cooking!
Blaming others	Everyone I meet is such a jerk. Why aren't people more friendly?	I am going to make more of an effort to meet people who share my interests.

"Embracing Wellness," "Ask Yourself," and "Take Charge" sections encourage students to relate material to their own lives, to examine their health-related behaviors, and to take responsibility for those behaviors and change them when necessary. Many of these sections are paired with assignable and assessable activities in Connect.

Effective and lasting behavior change is given even greater emphasis in the 13th edition, with a streamlined pedagogical program focusing on actions student can take now and in the future, a new box program ("Wellness on Campus") focusing on the health and well-being of college students, and a new "Behavior Change Contract" in Chapter 1.

BEHAVIOR CHANGE STRATEGY Dealing with Social Anxiety

Shyness is often the result of both high anxiety levels and lack of key social skills. To help overcome shyness, you need to learn to manage your fear of social situations and to develop social skills such as appropriate eye contact, initiating topics in conversations, and maintaining the flow of conversations by asking questions and making appropriate responses.

As described in the chapter, repeated exposure to the source of one's fear—in this case social situations—is the best method for reducing anxiety. When you practice new behaviors, they gradually become easier and you experience less anxiety.

A counterproductive strategy is avoiding situations that make you anxious. Although this approach works in the short term—you eliminate your anxiety because you escape the situation—it keeps you from meeting new people and having new experiences. Another counterproductive strategy is self-medicating with alcohol or drugs. Being under their influence actually prevents you from learning new social skills and new ways to handle your anxiety.

- Watch your interpretations. Having a stress reaction doesn't mean that you don't belong in the group, that you're unattractive or unworthy, or that the situation is too much for you. Try thinking of yourself as excited or highly alert instead of anxious.
- Avoid cognitive distortions and practice realistic self-talk. Replace your self-critical thoughts with more supportive ones: "No one else is perfect, and I don't have to be either." "It would have been good if I had a funny story to tell, but the conversation was interesting anyway."
- Give yourself a reality check: Ask if you're really in a life-threatening situation (or just at a party), if the outcome you're imagining is really likely (or the worst thing that could possibly happen), or if you're the only one who feels nervous (or if many other people might feel the same way).
- Don't think of conversations as evaluations. Remind yourself that you don't

life—a course you're taking or a hobby you have—to something in the other person's life. Match self-disclosure with self-disclosure.

- Have something to say. Expand your mind and become knowledgeable about current events and local or campus news. If you have specialized knowledge about a topic, practice discussing it in ways that both beginners and experts can understand and appreciate.
- If you get stuck for something to say, try giving a compliment ("Great presentation!" or "I love your earrings!") or performing a social grace (pass the chips or get someone a drink).
- Be an active listener. Reward the other person with your full attention and with regular responses. Make frequent eye contact and maintain a relaxed but alert posture. (See Chapter 4 for more on being an active listener.)

At first, your new behaviors will likely make you nervous. Don't give up—these will

jump to pg go book contents search ebook go

CHAPTER 15. Cardiovascular Health

reading video images exercises my notebook

Chapter 15 Sections

PROTECTING YOURSELF AGAINST CARDIOVASCULAR DISEASE

There are several important steps you can take now to lower your risk of developing CVD (Figure 15.6). CVD can begin very early in life. For example, fatty streaks (very early atherosclerosis) can be seen on the aorta in children younger than age 10. Also, young adults with relatively low cholesterol levels go on to live substantially longer than those with higher levels. Reducing CVD risk factors when you are young can pay off with many extra years of life and health (see the box "Are You at Risk for CVD?").

Do More

- Eat a diet rich in fruits, vegetables, whole grains, and low-fat or fat-free dairy products. Eat five to nine servings of fruits and vegetables each day.
- Eat several servings of high-fiber foods each day.
- Eat two or more servings of fish per week; try a few servings of nuts and soy foods each week.
- Choose unsaturated fats rather than saturated and trans fats.
- Be physically active; do both aerobic exercise and strength training on a regular basis.
- Achieve and maintain a healthy weight.
- Develop effective strategies for handling stress and anger. Nurture old friendships and family ties, and make new friends; pay attention to your spiritual side.
- Obtain recommended screening tests and follow your physician's recommendations.

Do Less

- Don't use tobacco in any form: cigarettes, spit tobacco, cigars, and pipes; bids and clove cigarettes.
- Limit consumption of fats, especially trans fats and saturated fats.
- Limit consumption of salt to no more than 1500 mg of sodium per day.
- Avoid exposure to environmental tobacco smoke.
- Avoid excessive alcohol consumption—no more than one drink per day for women and two drinks per day for men.
- Limit consumption of cholesterol, added sugars, and refined carbohydrates.
- Avoid excess stress, anger, and hostility.

With the *Connect Plus* Interactive e-Book, students can access *Connect Core Concepts in Health* anywhere, anytime. Among its features are the ability to highlight, take notes, and bookmark key content, providing one place for simple, comprehensive review.

KEY FEATURES AND LEARNING AIDS

The streamlined pedagogical program for the 13th edition maintains important features discussing diversity, behavior change, and personal reflection, while integrating some key material into the body of the chapter. All features that appear with a Connect icon offer a linked Connect activity.



Diversity Matters features address the ways that our personal backgrounds influence our health strengths, risks, and behaviors.



Embracing Wellness boxes outline ways that physical health is influenced by *all* of the dimensions of wellness and provide strategies for improvement.



Assess Yourself features provide rubrics and assessments for students to use in analyzing their own health and health-related behaviors.



Critical Consumer sections help students to navigate the numerous and diverse set of health-related products currently available.



Take Charge boxes challenge students to take meaningful action toward personal improvement.

Behavior Change Strategy sections offer specific behavior management/modification plans related to the chapter topics.

Quick Stat sections focus attention on particularly striking statistics related to the chapter content.

Ask Yourself (Questions for Critical Thinking) sections encourage critical reflection on students' own health-related behaviors.

Tips for Today and the Future end each chapter with a quick, bulleted list of concrete actions readers can take now and in the near future.

Connect to Your Choices sections challenge students to explore their inner motivations for their health choices and to explore ways of translating this awareness into action.

CHAPTER-BY-CHAPTER CHANGES

Chapter 1

- The discussion of the dimensions of wellness has been thoroughly updated with the addition of *financial wellness* and refined explanations of emotional, interpersonal, and occupation wellness.
- All of the chapter's statistical material has been updated to reflect the latest information on morbidity, mortality, and measures of quality of life.
- The discussion of Healthy People 2020 has been updated with the newest round of objectives and the latest statistics on Americans' progress toward meeting these goals.
- A new Wellness Matters box, "Wellness Matters for College Students," introduces students to the wellness issues most relevant to their age and circumstances.
- A new blank Behavior Change Contract provides a vital tool for tracking and achieving meaningful behavior change.

Chapter 2

- Statistics on stress have been updated throughout, with data from the 2011 American Psychological Association's "Stress in America" survey.
- A new Wellness Matters box, "Coping with News of Traumatic Events," helps students deal with troubling news, whether it be about local, nation, or international events.
- An expanded discussion of the role of spirituality in managing stress includes spiritual engagement beyond the traditional definition of organized religion.

Chapter 3

- A new section on becoming resilient defines psychological resilience and provides tips for building personal resilience.
- All of the chapter's statistical material has been updated to reflect the latest information on the prevalence of psychological disorders among Americans.
- A new Wellness Matters box, "Deliberate Self-Harm," addresses the prevalence of and treatment for deliberate self-injury.
- Updated coverage of pharmacological therapy includes the latest drug therapies for depression, psychosis, and ADHD; discussion of the criticisms of drug therapy has been expanded.

Chapter 4

- Self-acceptance is added to the discussion of self-concept and self-esteem, including the role that adults play in nurturing self-acceptance in children.
- A new section explores the role that emotional intelligence plays in developing and maintaining meaningful relationships; tips are included on enhancing one's own emotional intelligence.
- The discussion of ending a relationship has been expanded to include "rebound relationships."
- A new section addresses the potential positive and negative effects that digital communication has on human relationships.
- The discussion of same-sex marriage has been updated to include the latest state and national legislature action.
- Demographic statistics have been updated throughout, with data from the U.S. Census Bureau, the National Center for Health Statistics, and others.

Chapter 5

- A new table about reproductive aging in women outlines the changes that occur in the female reproductive system from puberty to postmenopause.
- A new Wellness Matters box, "Questions to Ask before Getting Involved in a Sexual Relationship," prompts readers to consider their sexual beliefs, interest, and boundaries *before* entering a sexual relationship.
- Statistics on Americans' sexual attitudes and behaviors have been thoroughly updated.

Chapter 6

- An expanded discussion of the principles of contraception introduces students to the broad principles involved in effective contraception.
- A new Wellness Matters box, "Contraception Use and Pregnancy among College Students," provides the most up-to-date statistics on college-aged populations, including differences among races and ethnicities.
- Sections on the contraceptive ring, contraceptive implants, injectable contraceptives, and IUDs have been updated with the latest information about effectiveness and potential side effects.

- Statistics on the popularity and effectiveness of available contraceptive methods have been updated throughout.

Chapter 7

- Information about the current legal status of abortion has been updated to include the latest laws and restrictions.
- The most current statistics on abortion rates and methods have been integrated throughout the chapter.
- A new section provides information about a man's legal rights regarding abortion.

Chapter 8

- New information about ethnicity and genetic disease has been added to the Diversity Matters box.
- The sections about infertility and infertility treatments have been updated with the latest statistics and medical considerations.
- New information about the causes and survival rates of preterm birth is now included in the section about complications of pregnancy.

Chapter 9

- A new section addresses the rise of synthetic recreational drugs, including "bath salts."
- A new Wellness Matters box, "Drug Use among College Students," contains the latest statistics and data.
- Information about gender differences and drug use has been significantly revised.
- The section about the legal consequences of drug use has been updated and expanded.

Chapter 10

- A new Wellness Matters box about alcoholic energy drinks details the usage and dangers of these increasingly popular beverages.
- The newest data on binge drinking are included, along with discussion of the potentially harmful consequences of this practice.
- Material about gender differences and alcohol use has been integrated throughout the chapter.

Chapter 11

- Statistics on tobacco use have been updated with data from the National Survey on Drug Use and Health, the Youth Risk Behavior Strategy, the American Cancer Society, and others.
- Updated content about e-cigarettes addresses their composition and the validity of their marketing claims.

Chapter 12

- Coverage of U.S. food guidance systems has been updated to reflect the new 2010 Dietary Guidelines for Americans.

- Coverage of the USDA's new MyPlate has been added.
- The recommended Daily Allowances for calcium and vitamin D have been updated to reflect 2011 revisions to the Dietary Reference Intakes (DRIs) by the Food and Nutrition Board of the Institute of Medicine.
- New content about the 2011 Food Safety Modernization Act appears.

Chapter 13

- A new, more detailed definition of physical fitness opens the chapter.
- All exercise guidelines have been updated to reflect the 2011 statement of the ACSM.
- A new section about responders versus nonresponders to exercise addresses the variety of individual responses to any particular exercise program.
- A new section describes how to use a heart rate monitor to measure the intensity of exercise.

Chapter 14

- Statistics on overweight and obesity in the United States have been updated, including breakdowns by gender and race/ethnicity; all statistics reflect the latest numbers available from the CDC.
- Results of the latest research on overweight and obesity are addressed throughout the chapter.
- Material from the 2010 Dietary Guidelines for Americans on overweight and obesity has been added, including information about obesogenic environments.
- A new Wellness Matters box, "The Freshman 15: Fact or Myth?" addresses the true amount of typical college weight gain and provides tips for maintaining a healthy weight in college.

Chapter 15

- Statistics on heart disease have been updated throughout.
- New information appears about optimal cholesterol and LDL levels.
- New content addresses the use of statins to reduce the risk of CVD.

Chapter 16

- A new figure (16.1) provides data on cancer deaths attributable to cigarette smoking.
- A new section describes the link between the BRCA gene and breast cancer.
- Expanded coverage addresses environmental and industrial pollution as a cause of cancer.

- Information about screening and treatment for prostate cancer and ovarian cancer has been updated with the latest medical recommendations.
- New information appears about the treatment of melanoma.

Chapter 17

- Statistics on top infectious diseases nationwide and worldwide have been updated with data from the CDC and the WHO.
- A new Wellness on Campus box, “Meningococcal Meningitis and College Students,” provides information about the disease along with vaccination recommendations from the CDC and the American College.
- A new section provides coverage of the 2011–2012 controversy over suppression of influenza research.
- A new Embracing Wellness box, “Exercise, Diet, Body Weight, and the Immune System,” addresses the link between overall physical fitness and wellness and immunological health.

Chapter 18

- Statistics on the prevalence of HIV/AIDS and other STDs in the United States and worldwide have been updated throughout, with breakdowns by gender, ethnicity/race, sexual orientation, and sexual behavior; the latest numbers available from the CDC, the WHO, and UNAIDS are included.
- Content updates address the latest research on HIV/AIDS and other STDs.
- The new U.S. Preventive Services Task Force and American Cancer Society recommendations for Pap test and HPV test are included.
- New coverage addresses the STD lymphogranuloma venereum.

Chapter 19

- Updated coverage of global warming provides the latest scientific information about the problem and potential solutions.
- Information about renewable energy sources has been significantly updated with the latest usage statistics and technologies.

- A new section addresses the risk and benefits of extreme energy sources.
- All statistics have been updated throughout the chapter.

Chapter 20

- A new section about pharmaceuticals and the placebo effect integrates this coverage into the chapter.
- The Critical Consumer box “Evaluating Health News” has been significantly revised to better guide students through appraising the legitimacy of health information and recommendations.
- A new Wellness on Campus box guides students through the process of creating a personal health record.

Chapter 21

- Updated information discusses the dangers of distracted driving, including coverage of recent state legislation and the NTSB’s recommended ban on the use of portable electronic devices while driving.
- Statistics have been updated throughout with data from the National Safety Council, Federal Bureau of Investigation, CDC, WHO, and others.

Chapter 22

- A new section about sexual functioning in older adults describes changes that typically occur as we age.
- Expanded information about dementia discusses the latest Alzheimer’s research, as well as other common causes of dementia.

Chapter 23

- The chapter has been revised throughout to address the typical concerns of a student audience.
- The section about end-of-life care has been considerably revised, including a significantly expanded section about hospice care.
- Material about funeral procedures has been updated to reflect the rising prevalence of cremation in the United States.

TEACHING AND LEARNING WITH CORE CONCEPTS IN HEALTH



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Find materials you need to get your course up and running on www.mhhe.com/lnsel13e. There, you will find:

- Course Integrator guide
- Test bank
- PowerPoint slides
- Transparency masters and student handouts
- Health and wellness related weblinks

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